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Vol. 91 JULY 1944 No. 1

EXPERIMENT STATION RECORD

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EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

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RECENT WORK IN AGRICULTURAL SCIENCE [1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Report of the Chief of the Bureau of Agricultural and Industrial Chemistry, 1943, W. W. SKINNER (*U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1943, pp. 11–50*).—Research on industrial utilization of farm products is reported upon in considerable detail. Among topics taken up are the solution of food dehydration problems; preservation of the quality of fresh foods by quick-freezing processes; the salting and brining of vegetables usually canned; the relationship between chemical composition and allergenic activity; great improvement in the yields of penicillin (U. S. D. A. Northern Regional Research Laboratory); production of butylene glycol from grain by fermentation and conversion of the glycol to butadiene; recovery of rubber from domestic plants; synthesis of polyester elastomers from seed oils, including the production of Norepol, a rubber substitute capable of replacing rubber in many applications; preparation of a polyamide of residual dimeric fat acids, named "Norelac" and capable of serving many of the purposes of thermoplastic resin and of a shellac substitute and lacquer constituent; "Noreseal," a substitute for cork in bottle caps, made from farm products; and "Noreplast," a new type of plastic made, in part, from farm waste—all developed at the Northern Regional Research Laboratory; research on lactic acid as a source of resinous and rubberlike plastics and development of a method for preparing highly substituted starch ethers having plastic properties which can be compounded on conventional rubber-working rolls with pigments, sulfur, and accelerator, and subsequently vulcanized to yield a product having a smooth glossy surface and resembling hard rubber in many respects—both developed at the Eastern Regional Research Laboratory; retardation of the deterioration of fats and oils and some modifications of the domestic seed oils for new uses—both developed at the Southern Regional Research Laboratory. Numerous other accomplishments of the regional research laboratories are also reported.

[1] The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

585606—44——1

A quantitative study of the heat labile sulfides of milk.—I, Method of determination and the influence of temperature and time. II, General origin of sulfides and relation to total sulfur, total nitrogen, and albumin nitrogen. III, Influence of pH, added compounds, homogenization, and sunlight, R. C. Townley and I. A. Gould. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), Nos. 8, pp. 689–703, illus. 7; 9, pp. 843–851, illus. 1; 853–867, illus. 4*).—In the three papers here noted, the data recorded and discussed were obtained by a procedure essentially as follows: The heat-volatile sulfides were measured quantitatively by aspirating the milk with nitrogen during the heat treatment and for 30 min. thereafter, collecting the liberated sulfides in alkaline zinc acetate, producing methylene blue by the addition of hydrochloric acid solution of *p*-aminodimethylaniline in the presence of ferric chloride, and measuring the intensity of the blue color photometrically.

The work reported upon in paper I showed that when the milk was heated for 0-, 30-, and 60-min. periods at approximately 70°–95° C., an increase either in time or in temperature increased the volatile sulfur values and decreased the critical temperature. Although variations occurred between different milks, the liberated sulfur for six samples averaged 0.018, 0.053, 0.130, and 0.240 mg. per liter when the milk was heated momentarily to 76°, 80°, 86°, and 90°, respectively. Prolonged heating of milk at 90°–95°, heating it for a short period at this temperature range in a sealed can, or heating it for a short period to temperatures above boiling, decreased the sulfide liberation or prevented it entirely. A possible relationship between the decrease in the hydrogen sulfide liberation, the production of a caramel flavor, and the browning of milk is indicated.

In paper II it is shown that the total quantities of sulfides liberated per liter from milk, skim milk, skim-milk whey, cream, buttermilk, and buttermilk whey, when they were heated momentarily to 90° and aspirated for 30 min. thereafter, were approximately as follows: Milk 0.24 mg., skim milk 0.158, skim-milk whey 0.205, cream (30 percent) 0.480, buttermilk (from 30 percent cream) 0.512, and buttermilk whey (from 30 percent cream) 0.575 mg. Heat labile sulfides of milk and milk products were found to originate from (1) the milk serum, and (2) the material associated with and firmly attached to the fat globules. Whey proteins are the chief sources of heat labile sulfides in products low in fat, whereas the fat-associated constituent (or constituents) is responsible for an important share of the sulfides in products high in fat or those secured from high-fat products by churning. It is concluded from these observations that there is not necessarily a direct relationship between the sulfide liberation of milk and milk products and the total sulfur and total nitrogen content, and that the heat instability of the fat-associated material appears to be responsible for the fact that cream, buttermilk, and buttermilk whey exhibit lower critical temperatures and greater sulfide liberation than milk, skim milk, and skim-milk whey.

Sulfide liberation from milk is shown in paper III to be decreased either by low pH values or pH values above 9, by sugars, formaldehyde, cystine, sodium chloride, hydrogen peroxide, iodine, and the following metals: Copper, silver, mercury, and iron. An increase in the heat labile sulfides resulted from increasing pH values between 6.5 and 9, and by the addition of ethyl alcohol, sodium sulfite, and cysteine-HCl. Factors which apparently had no effect upon the formation of sulfhydryl compounds in milk were homogenization, sunlight, and the addition of salts of nickel, tin, aluminum, and manganese. It was found that sulfide liberation from milk may be decreased (1) by treating milk so that the denaturation and coagulation of serum proteins are retarded or prevented,

(2) by oxidizing or blocking out the sulfhydryl groups as they are formed, or (3) by adding materials that will combine with the liberated sulfides. Increase in sulfide liberation may be produced (1) by treating milk so that denaturation and coagulation of serum proteins are favored, or (2) by creating a reduced system through the addition of suitable reducing agents.

Paper IV of this series has already been noted (E. S. R., 90, p. 146).

Factors affecting the color and clarity of casein plastics, H. F. Fick and H. H. Sommer. (Univ. Wis.). (*Jour. Dairy Sci., 26 (1943), No. 7, pp. 591–607, illus. 2*).—Equipment and procedures for converting casein into plastic test strips that are suitable for accurate color and clarity measurements are described. By extracting a rennet casein of good quality with alcohol or acetone at 140°–150° F., it was shown to be possible to make from it a plastic with very low color and high transparency.

Among factors tending to produce opacity in the plastic were found fat and color; inclusion of buttermilk; riboflavin held by the casein (largely responsible for the yellow color of the plastic, especially if the casein was poorly washed); alum additions; formaldehyde curing of the plastic; excessive heating of the skim milk from which the casein is made; high acidity in the skim milk (which gives poorer washing qualities to the casein, causes greater fat retention by the casein, and lowers its ash content); incorporation of coagulated whey proteins (which causes increased opacity in the plastic); and prolonged drying or exposure of the casein to excessive temperatures (detrimental to the color and clarity of the plastic, especially if the casein was poorly washed). Extraneous matter may also be a source of color and opacity in the plastic.

Incipient putrefaction of the casein prior to drying was not detrimental to the color or clarity of the plastic, but in some cases led to gas holes in it. The method of making rennet casein with agitation applied during the coagulation produced some improvement in the color and clarity of the plastic due to the better washing qualities of the casein and its lower fat content. The time for making the casein is reduced by this method, but there is a slight loss in yield.

The sedimentation and diffusion behavior of certain nucleic acid preparations, H. G. Tennent and C. F. Vilbrandt. (Univ. Wis.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 3, pp. 424–428*).—From measurements of sedimentation velocity, diffusion, and apparent specific volume made on solutions of nucleic acid preparations, molecular weights, frictional ratios, shape factors, and molecular dimensions were calculated. Three sodium thymonucleates, prepared without the use of strong reagents or elevated temperatures, were present in solution as long as molecules of which the molecular weights were in the neighborhood of 500,000. Thymonucleic and yeast nucleic acids, pancreas polynucleotide, and barium thymate showed molecular weights between 3,000 and 7,000. The cross-sectional diameters of the molecules of the five substances for which shape factors could be calculated were identical within the limits of experimental error, regardless of the molecular length. These values agreed very well with the dimensions calculated from X-ray data for the same samples in the solid state.

[Potato starch investigations], (*Maine Sta. Bul. 420 (1943), pp. 455–457, 481–482*).—After laboratory and commercial tests had given satisfactory indications, many carloads of Maine potato starch were, for the first time in the history of the Maine starch-producing business, converted into glucose for blending sirups. Even poor grades of Maine starch, normally not readily marketed, were satisfactory for this use.

Results of the examination of 16 samples of starch-factory potatoes and of 28 samples of commercial potato starch are tabulated.

With reference to starch content, it was found that the Green Mountain variety contained the greatest percentage of starch, as usual, but the source of potassium, other than the chloride, had little effect on the starch content of this variety. In the Sebago variety, the higher starch percentages were obtained in the plats receiving potassium sulfate or potassium metaphosphate and potassium nitrate.

Cellulose and cellulose derivatives, edited by E. Ott (*New York: Interscience Pubs., 1943, pp. 1176+, illus. 289*).—The editor of this monograph notes that "the knowledge of this field of chemistry, which for years was on an entirely empirical basis, has reached the point where a number of important concepts have been formulated and substantiated in a manner which permits a simplified review of the whole field." The subject matter "is admittedly still very complex, but this complexity can now be recognized as an inherent characteristic of the field rather than as an irritating and confusing complication. . . . In organizing this book, the primary objective has been to furnish, in a straightforward manner, digested information which is directly related to the most generally accepted present-day picture of the field."

The main sections of the book, each containing a number of chapters, are as follows: Occurrence of Cellulose, by K. Ward, Jr. (pp. 5–25) (U. S. D. A.); Chemical Nature of Cellulose and Its Derivatives, by C. B. Purves, A. M. Sookne, M. Harris, H. Mark, and H. A. Rutherford (pp. 27–199); Structure and Properties of Cellulose Fibers, by W. A. Sisson, G. J. Ritter (U. S. D. A.), C. W. Hock, H. Mark, G. R. Sears, E. I. Valko, and J. d'A. Clark (pp. 201–423); Carbohydrates Normally Associated With Cellulose in Nature, by A. G. Norman (Iowa State Col.) (pp. 425–446); Lignin and Other Noncarbohydrates, by F. E. Brauns (pp. 447–472); Preparation of Cellulose From Its Natural Sources, by C. M. Koon, E. F. Hinner, H. F. Lewis, K. Ward, Jr., and S. D. Wells (pp. 473–555); Bleaching and Purification of Cellulose, by R. S. Hatch (pp. 557–604); Derivatives of Cellulose, By H. M. Spurlin, J. Barsha, C. J. Malm, C. R. Fordyce, L. B. Genung, W. D. Nicoll, R. F. Conaway, S. L. Bass, A. J. Barry, A. E. Young, and E. Kline (pp. 605–850); Physical Properties of Cellulose and Its Derivatives, by H. M. Spurlin, M. L. Huggins, G. H. Pfeiffer, R. H. Osborn, H. Mark, and R. F. Nickerson (pp. 851–1052); and Technical Applications of the Physical Properties of Cellulose and Its Derivatives, by W. E. Gloor (pp. 1053–1110). An author index and a detailed subject index are provided.

A fluorescent alkaloid in rye-grass (Lolium perenne L.), I–IV, VI (*New Zeal. Jour. Sci. and Technol., 24 (1943), No. 4B, pp. 149B–150B; pp. 151B–155B, illus. 3; pp. 155B–159B; pp. 161B–166B, illus. 1; pp. 179B–185B, illus. 1*).—

I. *Introduction*, R. E. R. Grimmett and J. Melville.—A yellow, green-fluorescent alkaloid, "perloline," was isolated from ryegrass. Other alkaloids were also present in smaller amount.

II. *Extraction from fresh rye-grass and separation from other bases*, R. E. R. Grimmett and D. F. Waters.—For large-scale extraction of alkaloids from ryegrass an aqueous acid extract was neutralized with milk of lime, the pH adjusted to 7.5 with sodium carbonate, and the alkaloids recovered from the precipitate with excess sodium carbonate and alcohol. After shaking out with chloroform into acid the mixed alkaloids were separated into petrol-soluble (volatile), ether-soluble, and two chloroform-soluble (ether-insoluble) fractions containing alkaloids designated D, C, B, and A ("perloline"), respectively. Perloline was crystallized as the hydrochloride.

III. *Extraction and properties*, I. Reifer and N. O. Bathurst.—Methods for the preparation of the fluorescent alkaloid by aqueous and alcoholic extractions of ryegrass are described. A microanalysis of a purified sample of the hydrochloride gave the formula $C_{36}H_{22}O_3N_4(OCH_3)_4$ 2 HCl. Precipitation and color reactions are described, together with the crystalline forms of certain of its

derivatives. Other alkaloidal material is present in mother liquors from the preparation.

IV. *Methods of estimation, A, B.*—The method described under (A), The Estimation in Plant Tissue, by N. O. Bathurst, I. Reifer, and E. M. Clare, involves preparing an extract of the grass with dilute acid, making alkaline, extracting with chloroform under standardized conditions, and estimating the concentration with a Zeiss photometer, Bellingham and Stanley spectrophotometer, or Lovibond tintometer. Under (B), The Estimation in Animal Tissues and Fluids, by E. M. Clare, methods for estimation of perloline in body fluids, tissues, and excreta are described. The recovery of perloline added to such materials is shown to be satisfactory over a wide range of concentrations for all samples except liver and feces. The procedure for preventing loss of alkaloid in samples which are normally alkaline and which cannot be analyzed immediately is also described.

VI. *Investigation of a volatile base C_6H_7N*, F. B. Shorland, E. P. White, and R. E. R. Grimmett.—The occurrence and properties of a volatile base C_6H_7N are described. The absorption spectra, chemical reactions, and physical properties showed marked similarity of the base to the picolines. Failure to obtain acidic products by oxidation of the base with alkaline permanganate under conditions which readily yielded the expected acids from the picolines, and other conditions, suggested that the base could not be identical with a picoline.

Gas-absorption apparatus, L. Bolstad and R. E. Dunbar. (N. Dak. Agr. Col.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 8, p. 498, illus. 1*).—The absorption column proper consists of a piece of 6-mm. tubing which, in turn, is sealed through the end of a 20-mm. jacket. Just above its joint with the 6-mm. tubing, a 12-mm. tube carries four blown oblong punctures. The small inner tube is somewhat longer than the 20-mm. jacket, and the 20-mm. jacket is sufficiently contracted at its open end so that it retains a column of glass beads. The 12-mm. tube above the jacket passes through a rubber stopper fitting a small (125-cc.) filtering flask. The absorbing liquid is placed in the filtering flask in a quantity such that it just reaches the open lower end of the 20-mm. jacket. The gas to be absorbed is passed in through the side tube of the filtering flask. This apparatus was constructed to handle relatively large volumes of liquids or solutions and highly concentrated gases in small volumes, rather than small volumes of liquids and large volumes of dilute gases, which are provided for in conventional apparatus.

A mercury-balance pressure regulator, A. J. Bailey (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 4, pp. 283–284, illus. 2*).—A manometer-beam, or mercury manometer having a relatively long horizontal arm, is so pivoted and balanced by a spring of adjustable tension that passage of mercury into the reservoir connected to the evacuated system and located at the pivoted end of the beam will allow this to be raised by the spring and thus to open a leakage valve and reduce the degree of evacuation to that for which the controller has been set. Of this instrument, two types—neither requiring more than elementary glass blowing—are described and illustrated in diagrammatic drawings. The precision obtained with the regulator was for one of the two types about 0.1 mm. of mercury; the other regulated to a pressure closer than could be read with the unaided eye.

Improved steam-distillation apparatus, C. V. Bowen and W. F. Barthel. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 9, p. 596, illus. 1*).—A tubular distillation vessel is surrounded by a jacket into which the steam is driven before entering the distillation vessel proper. From the jacket the steam passes downward through a tube turning upward to enter the bottom

of the distillation vessel. A trap and arch are connected into the top of the distillation tube by a standard tapered glass joint and lead into a vertical condenser.

A molecular still of new design, F. W. Quackenbush and H. Steenbock. (Univ. Wis.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 7, pp. 468–470, illus. 4*).—A cyclic still of simple design for use in the purification of either large or small quantities of material is described. The evaporator surrounds the condenser, thus providing a large surface area for evaporation and a relatively small area from which the condensate must drain. During a distillation a magnetically driven rotor spreads the incoming distilland in a thin film over the evaporator surface. The condenser is attached through a ground joint, and its easy removal makes possible a rapid quantitative collection of either liquid or solid distillates. The still is glass-surfaced throughout and is therefore well adapted for use in autooxidation studies. This type of still, besides contributing to greater efficiency in distillation, makes the technic of molecular distillation applicable to a wider variety of laboratory problems than others hitherto in use.

Vacuum distillation equipment for volatile solids, L. Bolstad and R. E. Dunbar. (N. Dak. Agr. Col.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 7, p. 464, illus. 1*).—For the distillation of substances solid at ordinary temperature and capable of clogging delivery tubes, two round-bottomed flasks, A and B, of suitable capacity (50–500 cc.) are attached to a glass Y-tube of large diameter (15–25 mm.). The upper end of this Y-tube is sealed to a short length of 8-mm. glass tubing, so that it may be attached to a thermometer by a small section of rubber tubing. A convenient side arm is provided for evacuating the entire equipment.

The solid to be distilled is placed in flask A, the vacuum is applied, and flask B is cooled with running water. The application of heat to A causes the solid to distill, the temperature being recorded as usual on the thermometer. If the distillation is to be repeated, A, the distilling flask of the first distillation, is cleaned; the vacuum is again applied; B, the receiver in the first distillation, is heated; and A is now cooled as the receiver. This process may be repeated indefinitely. In case it becomes necessary further to subdivide the distillate at some definite temperature, the flask being used as the receiver may be replaced by one of a type consisting of two bulbs united by an inverted U-tube having a short neck at the top of the arch. A turn of 180° will throw either flask into position as the receiver. Rubber stoppers or, preferably, ground-glass connections may be used throughout in constructing the equipment.

Moderately large extractor-percolator assembly, F. A. Gunther. (Calif. Citrus Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 9, p. 562, illus. 1*).—The upper rim of a standard 2-gal. glass percolator is ground flat with 280-mesh Carborundum powder, so that a desiccator lid fits it snugly. If both the percolator rim and the desiccator lid are given a final grinding with 800- or 1,000-mesh Carborundum powder, no lubrication of the joint will be required even with petroleum spirit or diethyl ether as extracting solvent. A piece of glass tubing 15 mm. in diameter is irregularly flanged at one end and so bent as to avoid back drip directly into the boiling flask. This tube, or "chimney," carries the solvent vapors from the flask to the head space and condenser. A cotton plug is packed around the chimney where it passes down through the neck of the percolator. If true extraction is desired, a 2.5-3 cm. (1-in.) layer of clean sea sand or other inert, finely divided material is placed on top of this cotton plug to retard the rate of downflow of solution. A rubber stopper of the appropriate size to fit the flask is placed on the neck of the

percolator, and an efficient condenser is attached to the upper opening of the desiccator lid by means of another rubber stopper. If the drip from the condenser tends to excavate the top layers of the marc, a small watch glass, convex side down, or a small piece of filter paper may be placed on the marc.

A large-scale laboratory extractor of the Soxhlet type, K. E. Rapp, C. W. Woodmansee, and J. S. McHargue. (Ky. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 5, p. 351, illus. 2*).—A steam-coil heated extractor was constructed from two alcohol drums and other materials obtained from a plumbing shop. The capacity of this apparatus is approximately 50 lb. of dried plant material. With this charge the solvent requirement is 25–35 gal., most of which is recovered after extraction.

Laboratory deodorizer for fats and oils, A. E. Bailey and R. O. Feuge. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 4, pp. 280–281, illus. 1*).—A distinctive feature of this apparatus which makes possible a simplified design is its operation under a pressure of about 1 mm. of mercury instead of the 5–10 mm. under which most such installations operate. Since steam requirements in deodorization are directly proportional to the total pressure, the quantity of steam which must be generated and condensed is extremely small. This permits the use of a special, small-volume steam generator and condensation of all vapors in simple dry-ice traps. Volatile substances removed from the oil are quantitatively recovered in the condensers.

The steam generator consists of two bulbs connected by capillary tubing. One bulb serves as a water reservoir. The other bulb is partially filled with asbestos, the top layer of which is covered with a film of carbon black, to enhance the absorption of heat. Heat necessary to generate the steam by evaporation from the surface of the asbestos is supplied by a 250-w. infrared lamp. Vacuum for the apparatus is provided by an ordinary rotary oil-sealed pump.

Calibration of a photoelectric colorimeter for the determination of chlorophyll: Relation between spectra of standards and accuracy of analytical results, C. L. Comar, E. J. Benne, and E. K. Buteyn. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 8, pp. 524–526, illus. 2*).—A comparison is presented of the absorption spectra of three chlorophyll preparations and the analytical results obtained when these preparations are used as standards for the calibration of a photoelectric colorimeter. Analytical values from 24 different plant sources show that deviations as high as 75 percent from the true values may occur, depending on the purity of the standard. A simple plant extract may be used for calibration purposes where it is possible to have an aliquot of the extract analyzed for chlorophyll, using an established spectrophotometric method and published absorption coefficients, thus avoiding the uncertainties involved in the use of chlorophyll preparations as standards. Absorption curves showing the wide discrepancies discovered accompany the paper.

An improved salt bridge for polarographic and potentiometric measurements, D. N. Hume and W. E. Harris (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 7, p. 465, illus. 1*).—The authors found inverted-U bridges with ground glass plugs at the ends to have a resistance too high for best results in polarographic work in which a reference electrode is to be used as the anode. Sintered-glass end plugs lower the resistance, but the rigidity of the all-glass construction remains a drawback of such a design. In the authors' bridge, which overcomes both defects, the saturated potassium chloride solution constituting the bridge fills the calomel electrode vessel, a short glass tube rising therefrom, and a convenient length of soft rubber tubing. The dipping end of the bridge consists of a short length of glass tube inserted into the rubber tubing and filled

with potassium-chloride-saturated 3-percent agar gel. Diffusion of potassium chloride into the solution under examination can be eliminated entirely by placing the end of the bridge containing the agar tube in a larger tube plugged at the bottom with agar, containing the same salts as does the sample solution, and dipping into the sample solution.

Absorption tube tares in carbon and hydrogen microdetermination, W. M. MacNevin and J. E. Varner. (Ohio State Univ.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 3, pp. 224–225*).—A third Pregl-type tube is used both as a control and tare. If the tubes are not wiped, they are constant in weight as soon as they can be weighed. The tubes remain fairly constant in weight for 1 hr. and show only slight variations over much longer periods. The use of a third tube as tare and control does not eliminate the high hydrogen values usually obtained at high atmospheric humidities. The use of extra weights to tare the gain in weight of the absorption tubes does not introduce a noticeable error.

Removal of air from powders in density determination, E. L. Gooden. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 9, pp. 578–579, illus. 1*).—The pycnometer flask is supported in a simple holder set upon a special head fitted to a massage vibrator, this arrangement being placed under a vacuum bell jar on a suitable rubber-covered base. The vibrator is operated through a voltage-controlled transformer, and the degree of evacuation must be kept under manual control by means of a leakage tube held in the hand and closed by a finger.

Quantitative estimation of acetyl in carbohydrate acetates, R. I. Whistler and A. Jeanes. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 5, pp. 317–318, illus. 1*).—The acetates are transesterified by sodium methoxide catalyst in anhydrous methanol to yield methyl acetate, which is quantitatively distilled, and saponified in standard alkali. The method is rapid, gives reproducible results, and yields acetyl values which are not affected by the presence of nonvolatile acidic groups in the sample.

Determination of combined formaldehyde in organic compounds and in cellulose formals, C. L. Hoffpauir, G. W. Buckaloo, and J. D. Guthrie. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 9, pp. 605–606, illus. 1*).—Combined formaldehyde can be determined in organic compounds and in cellulose formals by a method that omits distillation and determines formaldehyde in the hydrolyzate by a Schiff's reagent procedure adapted to photoelectric colorimeter.

Determination of furfural, I. J. Duncan. (W. Va. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 3, pp. 162–164*).—The steam distillation of pentoses and plant material with hydrochloric acid resulted in higher yields of furfural than steam distillation with phosphoric acid. The use of 12 percent hydrochloric acid required at least twice as long as 18.5 or 24 percent hydrochloric acid to remove all the furfural. The yield of furfural from xylose was approximately the same when the three concentrations were used.

In the application of the aniline acetate colorimetric method, the addition of small amounts of oxalic acid and disodium phosphate to the color reagents resulted in increased color intensity and slightly shortened the time required for maximum color to develop. The colorimetric method was not affected by methyl furfural or hydroxymethyl furfural. The distillates from alfalfa or sweetclover produced colored solutions very similar to that produced with pure furfural, as shown by spectrophotometric curves. The titration method of Hughes and Acree (E. S. R., 74, p. 300) gave consistently higher results than the colorimetric method when applied to the distillates from pure sugars, alfalfa, or sweetclover. This may be due to the presence of reducing substances other than furfural in the distillates. It is believed that the colorimetric method may be more accurate.

Microdetermination of hydroxyl content of organic compounds: Acetic anhydride-pyridine mixture as reagent, J. W. Petersen, K. W. Hedberg, and B. E. Christensen. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 3, pp. 225–226*).—A method based upon acetylation with acetic anhydride in pyridine solution and adapted for use with samples of 2–10 mg. is described. The necessity for redistilling the anhydride to insure the absence of free acetic acid before the esterification is emphasized.

Colored chromatograms with higher fatty acids, M. M. Graff and E. L. Skau. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 5, pp. 340–341, illus. 1*).—The authors describe a method for separating mixtures of higher fatty acids by Tswett adsorption analysis, whereby separation into zones was observed on a column of heavy magnesium oxide impregnated with a suitable indicator. The fatty acids were recovered by dissolving the magnesium oxide in sections of the column in acid and extracting with ether. By this procedure, an unsaturated fatty acid was separated from a saturated fatty acid of the same number of carbon atoms and of two saturated fatty acids differing in chain length by four carbon atoms.

Rapid determination of starch: An index to maturity in starchy vegetables, J. P. Nielsen. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 3, pp. 176–179, illus. 3*).—A method for the determination of starch in certain vegetables which was found to be very rapid and reasonably accurate includes grinding the fresh sample in a specified commercial type of disintegrator, extracting the starch with 4.0 to 4.8 M perchloric acid, and estimating by photoelectric colorimeter the dissolved starch indicated by the blue color produced with iodine. Alcohol extraction of the products studied was found unnecessary. The use of a red filter in the colorimeter considerably reduced the error produced by dextrines.

Amylose and amylopectin content of starches determined by their iodine complex formation, F. L. Bates, D. French, and R. E. Rundle. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 2, pp. 142–148, illus. 7*).—Starch was shown to possess two components quite distinct in their reaction with iodine. A potentiometric method for the rapid quantitative determination of the amylose components of starch was developed and applied to a number of starches and starch fractions. The proportion of iodine bound by the amylose component of starch was found to vary inversely with the iodide concentration. Preliminary results indicated that affinity for iodine varies inversely with the degree of branching of the starch chains, and directly with the length of the starch chain. The amylose component of any one starch appeared fairly homogeneous in chain length. The synthetic starch of Hassid et al. (E. S. R., 86, p. 581), in agreement with their methylation studies, appeared to be essentially amylose.

Sugar analysis by alkaline ferricyanide method: Determination of ferrocyanide by iodometric and other procedures, D. T. Englis and H. C. Becker. (Univ. Ill.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 4, pp. 262–264*).—The oxidation of ferrocyanide with iodine may be accomplished by carrying out the reaction in slightly acid solution in the presence of a reagent such as phosphate or fluoride to a complex with the iron and prevent the reverse reaction. The oxidation may be carried out at room temperature with a 60–75 percent excess of iodine and a time interval of about 15 min. The volume of the reaction mixture must be such that the ferricyanide concentration is below 0.01 M. The excess iodine is titrated with standard thiosulfate.

A comparison of results obtained when the extent of the reduction of alkaline ferricyanide by dextrose and levulose was determined by direct oxidation of the ferrocyanide with iodine through an indirect estimation by determination of

ferricyanide iodometrically, and by direct oxidation of ferrocyanide with ceric sulfate, showed good agreement. The byproducts of the primary oxidation of the sugars appear, therefore, to have a negligible effect upon the accuracy of any of the methods used to estimate the ferricyanide consumed.

Determination of sugars in apple tissue: Some modifications of the usual procedures, R. H. LEONARD, R. C. MEADE, and R. B. DUSTMAN. (W. Va. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 9, pp. 579–582*).—In the analysis of apple tissue for sugars, it is advantageous to heat the tissues in closed aluminum containers before grinding; to disintegrate, mix, and extract the heated tissue in a specified commercial type of disintegrator; and to determine cuprous oxide by dissolving it in ferric sulfate solution and titrating with potassium dichromate in the presence of diphenylamine indicator. This procedure is said to be rapid and easily manipulated, and the results are sufficiently accurate for the determination of sugars in many plant materials.

A study of methods of obtaining milk samples for estimating milk fat by the Mojonnier method, E. O. HERREID and C. HARMON. (Vt. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 1, pp, 33–38*).—Comparing the three different technics commonly used in obtaining milk samples in the Mojonnier test procedure, it was found that inaccurate results were obtained by weighing milk in four pipettes on the weighing stand and transferring it to extraction flasks. Weighing milk directly into a tared extraction flask was the most reliable of the three methods. Measuring milk by volume into the extraction flask with a pipette would give sufficiently accurate results for routine work provided the pipette was calibrated for the amount of milk that it would deliver under standardized conditions. For sampling and delivering the milk sample into the extraction flask with a pipette by the second and third methods the thoroughly mixed milk should be at a temperature slightly above the melting point of the fat, for example, 35°–37° C.

Temperature errors in weighing and their control in the Mojonnier fat test, B. L. HERRINGTON. (Cornell Univ.). (*Jour. Dairy Sci., 27 (1944), No. 1, pp. 67–72, illus. 7*).—Based on a series of tests under different temperature conditions, it is shown that errors in the Mojonnier test may occur when the temperature of the room varies during the course of the analysis. The data indicate the magnitude of such errors. A method for overcoming this difficulty by the circulation of the water for the Mojonnier machine through an air-cooled radiator is described.

Final report of the sub-committee on the determination of the percentage of fat in sweetened condensed milk and evaporated milk, W. C. BROWN, E. O. HERREID, J. H. ERB, and W. D SWOPE. (W. Va., Vt., and Ohio State Univs. and Pa. State Col.). (*Jour Dairy Sci., 27 (1944), No. 1, pp. 53–55*).—On the basis of extensive comparisons of various methods, two methods, each of which give results in close agreement with the Mojonnier procedure, are recommended for the determination of fat in sweetened condensed milk and evaporated milk.

Phospholipids in dairy products.—II, Determination of phospholipids and lecithin in lipids extracted from dairy products, J. C. CRANE and B. E. HORRALL. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 10, pp. 935–942*).—Continuing this series (E. S. R., 88, p. 7), the total phospholipids and lecithin in the milk fat from cows of various breeds were found about equal, and there was no increase in the phospholipids of cows having mastitis. The amount of total phospholipids and choline associated with the fat was proportionately less in cream than in whole milk, although the ratio of total phospholipids to lecithin was not significantly different. About 43 mg. of choline were present per pound of experimental butter. The ratio of lecithin to total phospholipids averaged

46 percent for whole milk fat, 54 for fat from cream, 48 for butter lipids, and 34 percent for buttermilk lipids.

Microscopy of ice cream with polarized light, W. D. Keller, W. H. E. Reid, W. S. Arbuckle, and C. W. Decker. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 8, pp. 683–688, illus. 4*).—The technic described consisted essentially in the cutting of thin, freehand sections with a safety-razor blade in a suitable holder, from ice cream chilled to a maximum temperature of —15° F., the examination being carried out by means of a petrographical microscope or other microscope equipped with polarizing and analyzing prisms, with the sections immersed in ethyl acetate. Some other liquids of suitable refractive index may be used, but certain alcohols dissolved or melted the frozen material, even at —15°, and had to be avoided.

A proposed scheme of feedingstuffs analysis, E. W. Crampton and F. Whiting (*Jour. Anim. Sci., 2 (1943), No. 4, pp. 278–284, illus. 1*).—The authors describe a system of proximate analysis yielding figures for crude protein (N×6.25), ether extract, ash, soluble carbohydrates, and cellulose, by determination; and lignin, by difference. The oven-dried sample is subjected first to ether extraction yielding lipides and lipide-free residue. The lipide-free residue was subject to acid pepsin digestion and reflexing with 1 percent hydrochloric acid, and the insoluble residue from this treatment was used for the determination of insoluble ash and cellulose. In the filtrate from the acid pepsin and HCl treatment were determined soluble protein (Kjeldahl), soluble ash, and soluble carbohydrate.

Determination of free gossypol in cottonseed meal: A colorimetric method, C. M. Lyman, B. R. Holland, and F. Hale. (Tex. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 8, pp. 489–491, illus. 4*).—The gossypol is removed from a 2-gm. sample by continuous extraction (72 hr.) with ether containing about 2.5 percent of alcohol and from 1 to 1.2 percent of water. The ether is evaporated under diminished pressure. After addition of 5 cc. of n-butanol, the residue is made up to 25 cc. with the last-named solvent. Aliquots of from 2 to 5 cc. are treated, each with 2 cc. of freshly distilled aniline, and made up to 25 cc. for a turbidimetric comparison with like dilutions, made up without the aniline, at λ=440 mμ. The quantity of gossypol present was found to be accurately proportional to log $\frac{I_0}{I_1}$, I_0 being the intensity transmission without aniline and I_1 the intensity transmission with the addition of the precipitant.

A viscometric method for determining free menthol in peppermint oil, L. J. Swift and M. H. Thornton. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 7, pp. 422–423, illus. 1*).—The authors show that menthol has a viscosity so much greater than that of other components of peppermint oils that a quantitative determination of the menthol content from the Ostwald pipette drainage data is reasonably accurate. The percentage in excess of the true menthol determined as a result of the presence of an interfering substance was correlated with the insolubility of the oil in a mixture of equal parts by volume of methanol and 70 percent ethanol. The various degrees of turbidity produced when the oil was mixed with four volumes of the solvent mixture were designated by letters and assigned the numerical correction: A, clear to opalescent, 3.3 percent; B, cloudy, 4.5 percent; and C, very cloudy to partly insoluble, 5.3 percent. These correction percentages were subtracted from the apparent percentage of free methanol. When menthol, menthone, and menthyl acetate were allowed to drain from an Ostwald pipette at 50° C., the results, for a sample of 3 cc., were: Menthol, 1,077.2; menthone, 151.8; and menthyl acetate, 210.4.

Determination of toughness of frozen asparagus (Asparagus officinalis), F. A. Lee. (N. Y. State Expt. Sta.). (*Food Res., 8 (1943), No. 3, pp. 249–253*).—The samples of asparagus used in these tests were selected to represent different degrees of toughness such as might exist in samples graded as small, medium, and large or as fancy cuts; in lots fresh from the field or held in room storage for different lengths of time; and in lots made up of shoots left in the field until high and branched. Spears were cut to an arbitrary 5-in. length and blanched, frozen, and stored under commercial conditions. These samples, thawed at room temperature overnight and drained, were used for organoleptic tests for toughness only and for determinations of substances insoluble in boiling 80 percent ethyl alcohol. As the asparagus increased in toughness, the alcohol-insoluble substances decreased, indicating that this objective test could be successfully used in determining the toughness of frozen asparagus. The coefficient of correlation between alcohol-insoluble substances and the organoleptic tests for toughness was -0.8054 ± 0.0348 (standard error). Based on this work, the following standards of quality for the measurement of toughness of the standard 5-in. length by means of the percentage of alcohol-insoluble substances are suggested: Fancy 4.35 percent and higher, extra standard 4.34–4.05, and offgrade 4.04 percent and lower.

The occurrence of rotenone and related substances in the seeds of the berebera tree: A procedure for the separation of deguelin and tephrosin, E. P. Clark. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 1, pp. 27–29*).—Rotenone, dehydrorotenone, tephrosin, and two new compounds, one, $C_{21}H_{20}O_6$, m. p. 164°–165° [C.], and the second, $C_{23}H_{20}O_6$, m. p. 189°–190°, were isolated from the seeds of the African berebera tree. A revision of the melting point of tephrosin from 198° to 201° and of isotephrosin from 252° to 260° was made. A procedure for the separation and purification of deguelin and tephrosin when the two substances occur together is suggested.

A method for the determination of peroxidase activity, J. B. Sumner and E. C. Gjessing. (Cornell Univ.). (*Arch. Biochem., 2 (1943), No. 3, pp. 291–293*).—The method described as to procedure and reagents is a modification of the method of Willstätter and Stoll. The modified procedure employs a small volume of digest containing phosphate buffer and a relatively high concentration of hydrogen peroxide. After the addition of sulfuric acid to stop the enzyme action, the purpurogallin, formed by the action of peroxidase and peroxide on the pyrogallol in the presence of the buffer, is extracted with ether and the filtered ethereal solution is read in a Fisher A. C. electrophotometer. The reading obtained is compared with a standard curve to obtain the milligrams of purpurogallin; this value is divided by 1,000 to give peroxidase units.

A comparison of milkweed, horseradish, and turnip peroxidases, J. B. Sumner and E. C. Gjessing. (Cornell Univ.). (*Arch. Biochem., 2 (1943), No. 3, pp. 295–299, illus. 4*).—The peroxidase preparations were tested for their activity by the method noted above. Milkweed peroxidase was found to differ from horseradish and turnip peroxidases in requiring a higher concentration of hydrogen peroxide for optimum action and in not being inhibited by high concentrations of hydrogen peroxide. In addition, milkweed peroxidase was inactivated to a greater extent than the other two peroxidases when allowed to stand in contact with peroxide or pyrogallol. The initial speed of the reaction on pyrogallol was greater with milkweed peroxidase than with the other two peroxidases. Finally, the milkweed peroxidase was more resistant to heat than the others.

Spectrographic analysis of plant ash for several elements simultaneously, R. C. Nelson, P. C. Hamm, and Y. S. Tsiang. (Minn. Expt. Sta.). (*Plant Physiol., 18 (1943), No. 4, pp. 699–703, illus. 2*).—The authors describe a method

for determining in ash samples a number of elements simultaneously by using an increased number of exposures, simple density measurements without internal standardization, and a procedure for establishing a calibration curve without the use of an artificial standard. This technic was adapted to the analysis of samples of bromegrass for iron, manganese, copper, calcium, potassium, and magnesium.

Semimicroanalysis of saline soil solutions, R. F. Reitemeier. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 6, pp. 393–402, illus. 4*).—A system of photometric and volumetric analytical semimicromethods for ions that contribute to soil salinity is described. These methods permit a considerable reduction in the quantity of soil solution required. They also save reagents and time. The precision and accuracy of the methods are considered adequate for most soil analyses.

Determining magnesium in plants and soils: Adaptation of the 8-hydroxyquinolate micromethod, M. E. Weeks and J. R. Todd. (Ky. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 4, pp. 297–299, illus. 2*).—A micromethod for magnesium based on precipitation with 8-hydroxyquinoline was adapted for the determination of this element in soils and plant materials. Precipitation and determination were found to be most satisfactory and reproducible when the magnesium in the test solution amounted to between 0.1 and 0.7 mg. Magnesium was accurately estimated by the green color of iron hydroxyquinolinate in acetic acid solution.

Benzoin as fluorescent qualitative reagent for zinc, C. E. White and M. H. Neustadt. (Univ. Md.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 9, pp. 599–600*),—Benzoin in the presence of alkali and magnesium ion reacts with zinc to produce a green fluorescent compound having a spectral range from 4,650 to 5,700 a. u. The reagent is highly specific for zinc; interference is given only by beryllium, boron, and antimony. While the test is not as sensitive as the one using dithizone, it is pronounced and easy to observe. By comparison with a standard, concentrations differing by 10 μg. at lower concentrations can be distinguished.

Determination of sulfur residues from sulfur application on citrus foliage, F. A. Gunther, R. L. Beier, and J. P. LaDue. (Calif. Citrus Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 9, pp. 574–575*).—Elemental sulfur (98 percent sulfur by weight) mixed with a sulfur-free spray oil was applied to lemon leaves and then stripped off with purified carbon disulfide. After removal of the solvent, the sulfur was oxidized to inorganic sulfate by alkali fusion, and the sulfate ion was determined gravimetrically by precipitation as the barium salt. No special apparatus was required, and 10–200 μg. of sulfur per square centimeter of leaf surface were determined rapidly and accurately in field practice. Surface areas were measured photoelectrically.

A report on home dehydration of food products, G. E. Henderson (*Agr. Engin., 25 (1944), No. 2, pp. 52, 55*).—The author reports and discusses opinions (expressed mainly by farm people in Virginia, Alabama, and Mississippi) for and against dehydration as now used. The general conclusion is reached that home dehydration equipment may be expected gradually to replace the older methods of drying, providing low-cost, efficient equipment in the form of fan-heater-thermostat kits or commercially built cabinets becomes available. Unless unexpected shortages of materials for home canning occur, there will not be a major change in home food preservation methods during the war. The extent of the future development of home dehydration will depend upon technological advances in this and other forms of food preservation.

Commercial dehydration of fruits and vegetables, E. H. Wiegand, H. S. Madsen, and F. E. Price (*Oregon Sta. Bul. 417 (1943), pp. 39, illus. 9*).—This

bulletin discusses the adaptation of existing fruit drying plants to the dehydration required for military, lend-lease, and civilian vegetable supplies. The authors point out that natural-draft dehydrators suitable for fruits need addition of forced-draft equipment for the handling of the greater moisture content of most vegetables. The requirements of the War Production Board with respect to priorities for additional equipment are also discussed. Methods of dehydration, including single-stage and two-stage tunnel drying, are described. General handling and pretreatment, dehydrating fruit, vegetable blanching, and the detailed procedure for various vegetable crops are dealt with. An appendix discusses enzyme testing methods, sulfuring fruits, and the determination of moisture content.

Potato dehydration, (*Maine Sta. Bul. 420 (1943), pp. 457–460*).—Six potato dehydration plants were in operation in Maine with a total capacity of about 23 tons of dehydrated product per day, using about 200 tons of potatoes daily. Another plant had been equipped for hot fat dehydration (canned chips and shoestrings) and has had trial runs. One starch factory organization in Caribou was preparing for partial conversion of existing facilities. The waste from four of the above-listed dehydration plants may be worked up for its starch content. With mechanical peeling, in which from 15 to 30 percent of the potatoes may be included in the waste, and with a good starch market, an affiliated starch factory in operation can economically handle such waste. Of numerous types of dehydrating equipment in use in Maine, the tunnel drier with tray trucks is indicated as particularly favorable.

Preparacion de vinos en el hogar usando la manzana malaya, tambien conocida como pomarrosa americana [Preparation of wines in the home, using the Malayapple, also known as American rose apple], R. Arroyo (*Agr. Expt. [Puerto Rico Univ. Sta.], 3 (1943), No. 3, pp. 9–10*).—In response to a number of requests for directions for home preparation of a wine from the Malayapple (*Jambosa (=Syzygium) malaccensis*), the authors give nontechnical information. Both red and white wines may be made from this fruit. For either product, the fruit should not be picked up from the ground under the tree, but should be taken from the tree itself, and in a way that does not injure it. Only mature fruit should be taken, a condition recognized by a deep red color. The fruit should be used without delay, not more than 24 hr. being allowed between the gathering of the fruit and the preparation of the mash. Before using the fruit for the preparation of a must, or mash, it should be passed through a bath of boiling water, with which it is to be left in contact for 1 min., to destroy certain surface bacteria and fungi. For the preparation of a red wine, the stoned whole fruit is used. To produce a white wine the fruit must be peeled. For the fermentation one may use a commercial-brand yeast, but the wine will not be of the quality obtainable by using a special wine yeast. The latter, with direction for its use, is provided by the station. Fermentation should take place in a cool, clean place. Providing the barrel with a cooling coil through which cool water can be circulated will result in a much better product.

Bacteriological changes in cucumber fermentation, J. L. Etchells and I. D. Jones. (N. C. Expt. Sta. and U. S. D. A.). (*Food Indus., 15 (1943), No. 2, pp. 54–56, illus. 2*).—Active yeast fermentations were found in all brine treatments used. Active fermentations by the acid-forming bacteria were restricted to the 20° and 40° brines. An active hydrogen fermentation by the Aerobacter group was usually found in 60° brines. In the 40° brines an active hydrogen fermentation occurred in some instances. A relatively short fermentation by this group of organisms sometimes occurred in 20° brines.

Experiences of a paper mill in bacteriological control, G. M. Suydam and R. R. McConky (*Paper Trade Jour., 118 (1944), No. 8, pp. 31–34, illus. 5*).—The

means employed by one mill for producing paper of low bacterial count is discussed as a possible aid to others desiring to institute bacteriological control. Data are given to show the effects of the various treatments tested. The investigation has indicated that cleanliness throughout the mill, controlled break-point chlorination of the mill-filtered water, and white water chlorination on the paper machine are all necessary for optimum results as demonstrated by the low bacterial counts of the finished product.

Pasta para limpiar zapatos [Shoe-cleaning paste], F. Marrero (*Agr. Expt. [Puerto Rico Univ. Sta.], 3 (1943), No. 3, pp. 10–11*).—Two formulas are given and discussed. The purpose served by each of the several components is pointed out and the possibility of correcting unsatisfactory mixtures by increasing or decreasing the proportion of one or more of these components is indicated.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [August–November 1943] (*Mo. Weather Rev. [U. S.], 71 (1943), Nos. 8, pp. 137–147, illus. 6; 9, pp. 149–167, illus. 14; 10, pp. 169–178, illus. 6; 11, pp. 179–194, illus. 9*).—In addition to meteorological, climatological, solar radiation, and sunspot data in each number, No. 9 contains a contribution on Freezing and Thawing Dates of Lakes and Rivers as Phenological Indicators, by L. Wing (pp. 149–158), and No. 11, North Atlantic Hurricanes and Tropical Disturbances of 1943, by H. C. Sumner (pp. 179–183).

[Meteorological data] (*Georgia Coastal Plain Sta. Bul. 36 (1943), pp. 16–17*).—Tabulations are presented for the years 1923–42 of rainfall in inches by months and years and of dates of the first and last killing frosts and the number of growing days; and for 1942 of the temperature by months—all at Tifton, Ga.

Meteorological observations (*Maine Sta. Bul. 420 (1943), pp. 581–585*).—General meteorological summaries are presented for Orono and Presque Isle covering 1942–43 and rainfall records for Highmoor Farm covering May–October 1943.

Rainfall of northern Mexico, F. Shreve (*Ecology, 25 (1944), No. 1, pp. 105–111, illus. 3*).—During an investigation of the desert areas of northern Mexico it became necessary to give attention to the adjacent plant formations, which commonly have some ecological relationships to the desert, and in studying the physical conditions it was almost obligatory that the whole of northern Mexico—all lying north of the Tropic of Cancer and embracing about half of the country—be taken under consideration. This was particularly true of the precipitation, data on which are here used for the period 1921–40 since for this period there are a larger number of Mexican stations than for any previous one of the same length. A provisional map of the distribution of mean annual rainfall is based on records from 44 stations. Tables show the extremes of annual rainfall and the rainless periods for the east and west coasts, central plateau, and Baja California; and figures indicate the monthly distribution of rainfall in five areas each of northern and northwestern Mexico. A detailed discussion of the findings for the different areas is presented.

Freezing temperatures in the United States, S. S. Visher (*Ecology, 25 (1944), No. 1, pp. 113–117, illus. 17*).—Plants and animals of nearly all sorts are strongly affected by freezing, and the indirect effects are considerable, e. g., on soil, on the shores of water bodies, and on floods and their destructiveness. Many data on the occurrence of freezing temperatures in the United States, based on official Weather Bureau records, are presented on 17 maps and discussed.

Relation of weather conditions to onion blast, L. H. Jones. (Mass. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 1, pp. 139–147, illus. 2*).—This physiological disease, sunscald in nature, is said to result from inability of the plant to

become immediately adjusted to bright sunshine, high temperature, and low relative humidity after a period of wet cloudy weather accompanied by high relative humidity and high temperature. Abnormal development of soft tissues and a small root system under subdued light restricts the ability of the roots to replace moisture lost on resumption of optimum transpiration conditions; tissue dehydration follows, especially under direct sunlight. The extent and seriousness of the injury depends on the intensity of the two environments in relation to each other and on the developmental stage of the plant. By supplementing field observations with laboratory tests which simulated weather conditions, blast could be produced at will. Local weather records supplied data from which certain figures of cloudy weather, relative humidity, and hours of sunshine could be combined. The combinations may be visualized by superimposing dials, each adjusted according to the weather factor it represents; this dial chart is described and explained.

To orchardists: Hilltops warmer at frost periods, R. Woodburn (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 2, pp. 7, 8*).—A brief discussion of temperature differences within limited areas and of the greater safety from frosts in orchards planted on hilltops or not very far down the slopes as contrasted with those in valley situations.

Water year 1943 (*U. S. Geol. Survey, Water Resources Rev. U. S. and Canada, Water Year 1943, pp. 8+, illus. 3*).—The country-wide water situation for the United States and Canada is reported as dominantly favorable during the 12 mo. ended September 30, 1943. Data are summarized for the annual flow of four continental rivers; cumulative runoff; ground water (regional conditions and local areas of heavy pumping); storage for power, irrigation, and for city and industrial uses in various sections; floods; and droughts. The status of each of a large number of reservoirs is tabulated, and maps present the percentage of normal stream flow, departure of cumulative runoff from normal for selected index streams, and water levels in key observation wells.

Floods: Their cause and control, A. H. Richardson (*Forest & Outdoors, 1944, Feb., pp. 27–28, 32, illus. 3*).—A general discussion, with examples.

SOILS—FERTILIZERS

A report on soil tilth research (*Agr. Engin., 25 (1944), No. 2, pp. 48, 51*).—The Joint Committee on Soil Tilth recommends, in part, that as many experiment stations as can do so compare plowing, subsurface tillage, and disking for one or more important crops. In addition to yields, as much as possible of information concerning air-water relations in the soils studied should be obtained.

Effect of a hydrophilic colloid of high viscosity on water loss from soils and plants (a preliminary report), I. M. Felber and V. R. Gardner (*Michigan Sta. Tech. Bul. 189 (1944), pp. 30, illus. 15*).—A laboratory and greenhouse investigation of the effect of methyl cellulose on evaporation losses from the soil, its effect on transpiration losses from the plant, and the effect on rate of growth and water requirement. The methyl cellulose can be applied to the soil either by adding it to the soil surface or by mixing with the soil, and was found to influence significantly the rate of evaporation, transpiration, water requirement, and wilting without any harmful effects being noted. The authors suggest that these effects may have important application in field use.

The effectiveness of methyl cellulose-treated soils in retaining moisture against the evaporating force remained unaltered over more than 3 mo. Methyl cellulose restricts the water loss from soils so appreciably that soil moisture is still available to plants when it would be exhausted in nontreated soils under the same

atmospheric conditions. Plants used in these investigations have not been harmfully affected by methyl cellulose. In soils rich in organic matter, the treatment may cause a slight retardation of growth when the moisture content is high; however, in sandy soils growth is accelerated and remarkably benefitted under drying conditions. Methyl cellulose in culture solution effected a reduction of the water requirement of bean and corn plants amounting to about 30 percent during 1 mo. of growth.

Two devices for measuring soil erosion, W. D. Ellison. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 2, pp. 53, 55, illus. 2*).—A rain splash sampler and an overland flow sampler are described. The first of these devices consists of two catch pans used back to back, each being made 3¾ in. deep, with an opening 6 in. long and ½ in. wide, the edges flanged or lipped, and the back continued above the opening to form a splash board 5 by 6 in. Of these sampling pans, two are set back to back in a collecting tank 5½ by 6¼ by 1½ in. with a watertight metal septum. The surface flow sampler consists essentially of a narrow channel through which the sample is collected, provided with deflection fins and mounted upon a base or floor capable of being adjusted to the slope. The use of such instruments is briefly discussed.

Soil upkeep in wartime farming, C. O. Rost and P. M. Burson (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 2, pp. 8–9, illus. 6*).—Stressing the demands on soil fertility and organic matter for meeting wartime food production, the station has shown that after 60 yr. of cultivation the total organic matter of Minnesota soils has been reduced about 42 percent. Further decreases will limit production, and the station prescribes a definite system of soil management, including crop rotation, use of manure, crop residues, commercial fertilizers, and lime, improved cultural practices, and erosion control.

Physical land conditions on the San Mateo County soil conservation district, California, R. S. Ayers (*U. S. Dept. Agr., Soil Conserv. Serv., Phys. Land Survey No. 33 (1943), pp. 36+, illus. 16*).—A detailed soil and erosion survey, including recommended treatments and conservation farming methods and description of the agriculture and present erosion conditions in the county.

Chemical composition of certain forage crops as affected by fertilizers and soil types, S. C. Vandecaveye and G. O. Baker. (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 5, pp. 191–220, illus. 7*).—Analyses were made for ash, N, P, K, and Ca in 401 samples of forage obtained from 45 fertilizer experiments on 29 different soil types to determine the effect of different fertilizer treatments and soil types on the chemical composition of pasture herbage, mixed grass hay, alfalfa hay, and oats and wheat cut for hay. Differences in soil types had a pronounced effect on the N, P, K, and Ca content of these crops. The effect of fertilizer treatment on the concentration of these nutrient elements in the forages was less significant, although some crops were influenced more than others, pasture herbage being the most responsive one. In the majority of cases fertilizers supplying from 40 to 50 lb. of N, 80–90 lb. of P_2O_5, and 80–100 lb. of K_2O per acre, and applied alone or in combinations, caused marked increases in the percentages of N, P, and K, respectively, in the pasture herbage. The mixed grass hay was affected similarly but in a less pronounced degree. The general effect of mixtures of phosphate and potash fertilizers was a definite increase in the amount of clover in the mixed hay and to a lesser extent in the pasture herbage, with a consequent tendency to larger percentages of N, P, and K in these crops. The chemical composition of alfalfa, oat, and wheat hay was affected less than, but in the same direction as, that of the pasture herbage and mixed grass hay. Although the Ca content of the forage crops was influenced markedly

by differences in soil types, it was not affected significantly by fertilizer treatments.

Chemical, Mitscherlich, and Neubauer methods for determining available potassium in relation to crop response to potash fertilization, S. R. Olsen and B. T. Shaw. (Ohio Expt. Sta. and State Univ.). (*Jour. Amer. Soc. Agron., 35 (1943), No. 1, pp. 1–9*).—Crop response to potash on six Ohio soils from 1939 to 1941 was investigated with corn. A definite crop response was shown each year on the Clermont and Miami soils, a slight crop response was found on the Wooster and Mahoning soils, and none on the Muskingum and Brookston soils. Available potassium in each soil was determined by chemical, Mitscherlich, and Neubauer methods. All methods agreed in placing the soils in the same order with respect to available potassium as indicated by field response. The Mitscherlich and Neubauer methods gave a somewhat better differentiation of available potassium than the chemical test in the two soils which showed the most crop response to potash additions. The Neubauer method was used to study the amount of nonexchangeable potassium released from the silt fractions. Only three soils, the Clermont, Wooster, and Brookston, were examined. Significant amounts of potassium were removed by the rye seedlings from each fraction. As the particle size decreased, the amount of potassium removed increased. The lower the exchangeable potassium in the soil the greater was the proportion of potassium taken up from the silt fraction.

Effect of adding sodium to the fertilizer on cotton, H. P. Cooper and W. H. Garman. (S. C. Expt. Sta.). (*Amer. Fert., 100 (1944), No. 1, pp. 9–10*).—Data are presented on the comparative yield of seed cotton at the Sandhill Substation on Norfolk loamy soil at different levels of potash fertilization when sodium was added to the fertilizer. A progressive percentage decrease in yield of seed cotton was obtained from the use of sodium coincident with the increase in rate of potash fertilization. Where no potash was applied, the addition of sodium increased the yield 215 lb. of seed cotton per acre, or 70.3 percent; whereas with 60 lb. of potash the increase from the use of sodium was 182 lb., or 15.1 percent.

Studies of microbial activity, chlorate reduction, and chlorate toxicity in soils treated with sodium chlorate, R. T. Nelson. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 5, pp. 221–237*).—Studies made of microbial populations and microbial activity in soils treated with $NaClO_3$ showed that micro-organisms were not directly inhibited by amounts usually employed in weed control, but may become decreased due to the lack of organic matter ordinarily supplied by plant growth. Chlorate toxicity to plants was not decreased by the application of inorganic nitrate fertilizers. However, a decrease in toxicity was obtained from the application of manure. Chlorate determinations showed there was less residual ClO_3 left in the soil on manured plats. The rate of ClO_3 reduction is increased with an increase in microbial activity under conditions of poor aeration. Aerated soils supplied with readily available organic matter will reduce $NaClO_3$ in amounts equivalent to 800 lb. per acre when submerged in water a few days. The micro-organisms of the soil are directly or indirectly responsible for the rapid reduction of ClO_3.

Granular ammonium nitrate: A high-analysis, low-cost, all-purpose nitrogen fertilizer (*U. S. Dept. Agr., 1944, AWI–81, pp. 7, illus. 1*).—A popular leaflet containing information on the chemical nature, use, distribution, storage and handling, and value of granular ammonium nitrate.

AGRICULTURAL BOTANY

[Botanical papers] (*Torreya, 43 (1943), No. 2, pp. 98–125, 132–154, 170–173, illus. 4*).—Among the addresses presented at the seventy-fifth anniversary cele-

bration of the Torrey Botanical Club the following are of interest to botany: The Formative Influences and Comparative Effectiveness of Various Plant Hormone-like Compounds, by P. W. Zimmerman (pp. 98–115); Plants Need Vitamins Too, by W. J. Robbins (pp. 116–125); Criteria for the Indication of Center of Origin in Plant Geographical Studies, by S. A. Cain (pp. 132–154) (Univ. Tenn.); and The [Botanical] Field Trip to the New Jersey Coast and Pine Barrens Friday and Saturday, June 26–27, 1942, by E. J. Alexander and H. K. Svenson (pp. 170–173).

Manual of methods: Introductory (*Pure Cult. Study Bact., 12 (1944), No. 1, Leaflet 1, 9 ed., pp. 16+*).—This introductory leaflet takes up the purpose of the manual, including the meaning of pure culture study of bacteria, relation to taxonomy, and publications of the Committee on Technic (descriptive charts, manual of methods for pure culture study), a historical sketch of work on methods; use of the manual, including pitfalls to be avoided by the student, and practical hints for determining the characteristics of a culture, identification, and naming a new species; and a glossary of terms used in the manual and on the descriptive chart.

Amino acid requirement of Lactobacillus casei, B. L. Hutchings and W. H. Peterson. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 52 (1943), No. 1, pp. 36–38*).—"The amino acid requirement of *L. casei* was determined on a medium containing glucose, sodium acetate, salts, riboflavin, pantothenic acid, nicotinic acid, biotin, pyridoxine, adenine, and concentrates of the eluate factor (folic acid). The simplest amino acid mixture that would yield maximum growth on repeated subculture was: Leucine, serine, phenylalanine, glutamic acid, valine, aspartic acid, cystine, arginine, tryptophan, tyrosine, threonine, methionine, alanine, isoleucine, lysine, and histidine."

Antibacterial substances produced by moulds, III–V (*Austral. Jour. Expt. Biol. and Med. Sci., 21 (1943), Nos. 2, pp. 127–131; 4, pp. 249–257, illus. 1*).—In continuation (E. S. R., 89, p. 291), three papers are presented:

III. *The detection and estimation of antibacterial activity in vitro,* N. Atkinson (pp. 127–131).—A number of methods for both qualitative and quantitative detection of antibacterial activity were tested with a variety of active mold metabolism solutions and the relative merits of the methods discussed. For rapid detection of activity and for reliable estimation of potency of penicillin and penicidin fluids the method of dilution in agar is recommended; it allows the titration of the fluid against a range of bacteria under identical conditions.

IV. *The detection and occurrence of suppressors of penicidin activity,* N. Atkinson and N. F. Stanley (pp. 249–253).—A test for "penicidin-suppressors" is described; they have been demonstrated in culture media, serum, and various substances of animal and plant origin. These substances act slowly, but in 24 hr. at 37° C. produce a marked suppression. The activity of penicidin is also suppressed by sodium thioglycollate; the possible mechanism of the reaction is discussed.

V. *The mechanism of the action of some penicidin suppressors,* N. Atkinson and N. F. Stanley (pp. 255–257).—Penicidin is suppressed by SH compounds; it is suggested that its mechanism is a chemical reaction between penicidin and the SH group.

Penicillin, E. Chain and H. W. Florey (*Endeavour [London], 3 (1944), No. 9, pp. 3–14, illus. 10*).—This critical review (53 references) presents a summary of the history and present status of the subject, including the discovery of penicillin and of its chemotherapeutic properties. Included also are tables showing the dilutions of penicillin at which various inhibitory effects on different bacteria have been observed and the results of therapeutic tests on mice, as

well as a list of other antibiotic substances from bacteria and fungi with the authors and the organisms affected.

Purification and antibacterial activity of fumigacin and clavacin, S. A. WAKSMAN. (N. J. Expt. Sta.). (*Science, 99 (1944), No. 2568, pp. 220–221*).—During the 1.5 yr. since the first announcement of the production of these two substances by *Aspergillus fumigatus* and *A. clavatus*, respectively (E. S. R., 88, p. 26), they have been crystallized and their chemical nature determined. Moreover, each has been described under different names and one has been found to be produced by several different fungi. To avoid further confusion in the characterization of these two compounds, a brief summary (with bibliographic footnotes) of the results thus far obtained is presented.

Beobachtungen über die Lebensdauer von Pilzkulturen [Observations on the longevity of fungus cultures], K. H. ZOBL (*Arch. Mikrobiol., 13 (1943), No. 3, pp. 191–206*).—The viability of 153 species was investigated. As compared with most Ascomycetes, Basidiomycetes, and Fungi Imperfecti, the Mucoraceae proved very susceptible to desiccation, usually dying within 6–18 mo. Noteworthy was the ability of most pathogenic fungi to withstand drying without loss of germinability. Of all the fungi investigated, the perithecium-forming species of *Ceratostomella* and *Melanospora* were most resistant, germinating after 3.5, 6, and 7.5 yr.

The genera Trechispora and Galzinia (Thelephoraceae), D. P. ROGERS (*Mycologia, 36 (1944), No. 1, pp. 70–103, illus. 14*).—New nomenclature is involved in this taxonomic study of nine species of *Trechispora* (with key and species excluded from genus, including two Corticiums) and three of *Galzinia*.

Additions to the Uredinales of Venezuela, III, F. D. KERN and H. W. THURSTON, JR. (Pa. Expt. Sta.). (*Mycologia, 36 (1944), No. 1, pp. 54–64*).—Additions to the rust fungi previously reported (E. S. R., 89, p. 639) comprise 25 species, bringing the total up to 263 species belonging to 31 genera.

Notes on taxonomy and nomenclature of the polypores, R. SINGER (*Mycologia, 36 (1944), No. 1, pp. 65–69*).—The author and A. A. Bondarzew have worked out what they consider to be a more natural classification of the Polyporaceae; a brief outline of this system is here presented.

The North American variations of Distichlis spicata, A. A. BEETLE. (Univ. Calif.). (*Bul. Torrey Bot. Club, 70 (1943), No. 6, pp. 638–650, illus. 13*).—This genus presents an unusual problem among the grass genera of North America because of its dioeciousness. Its members occur primarily in alkaline situations, hence the common name "salt grass." The author presents a taxonomic study (with key) in which the species *D. spicata* is characterized and six varieties are described—four as new and two as new combinations. An annotated list of the specific names applied to *Distichlis* is appended.

Una nueva especie de "sorghum" cultivada en la Argentina, L. R. PARODI (*Rev. Argentina Agron., 10 (1943), No. 4, pp. 361–372, illus. 7; Eng. abs., pp. 371–372*).—The new species described, *S. almum*, is said to possess value as a forage plant; it is perennial with short ascending rhizomes and, like *S. halepense*, has 40 chromosomes in the somatic cells. Though its ancestors have not yet been identified, it appears to be a hybrid, one of its parents probably being *S. halepense*. A synopsis is given of the related species cultivated for forage in Argentina.

Especies de "Sida" espontáneas en la Argentina que pueden utilizarse como textiles [Species of Sida (Malvaceae) indigenous to Argentina which are utilizable for their fibers], A. DEL P. RODRIGO (*Rev. Argentina Agron., 10 (1943), No. 4, pp. 373–377, illus. 3*).—*S. cordifolia* and *S. rhombifolia* are considered.

The flora of Schuylkill County, Pennsylvania, P. R. Wagner (*Diss., Univ. Pa., Philadelphia, 1943, pp. 230+, illus. 2*).—The aim of this monograph was to describe the results of an extended study of the vascular flora of one of Pennsylvania's eastern counties, a region largely ignored by students of eastern Appalachian plants, and to analyze its several floral components as to number of species involved, their relative frequency, and their local distribution. The main sections deal, respectively, with the history, geography, and descriptive geology of the area, its botanical history, a floristic discussion of the county, and an annotated check list (pp. 42–227). Numerous keys and a bibliography of 36 references are included.

Las especies alimenticias de Amaranthus y Chenopodium cultivadas por los Indios de América [Species of Amaranthus and Chenopodium cultivated as food crops by the Indians of America], A. T. Hunziker (*Rev. Argentina Agron., 10 (1943), No. 4, pp. 297–354, illus. 23*).—Pertinent information is presented on the taxonomy, characteristics, food value, area where grown, etc., of these "pseudocereals." Indexes to the Latin binomials and Spanish common names and a bibliography of 48 references are included.

A thermolabile accessory growth-factor to Rhizobium, H. K. Chen and M. K. Hsü (*Nature [London], 153 (1944), No. 3870, p. 21*).—This preliminary report refers to a new thermolabile growth substance active on root nodule bacteria of the pea and cowpea group as test organisms and contained in a medium prepared from ground air-dried stems and leaves of *Vicia sinkiangansis.*

Desthiobiotin, D. B. Melville, K. Dittmer, G. B. Brown, and V. du Vigneaud (*Science, 98 (1943), No. 2553, pp. 497–499*).—A preliminary report of studies showing that desthiobiotin is equally as effective as biotin in stimulating growth of *Saccharomyces cerevisiae,* producing a readily noticeable effect at a concentration of less than 1:400,000,000,000, but that it does not stimulate growth of *Lactobacillus casei.*

The anti-biotin effect of desthiobiotin, V. G. Lilly and L. H. Leonian. (W. Va. Expt. Sta.). (*Science, 99 (1944), No. 2567, pp. 205–206*).—Through use of 45 biotin-requiring organisms the authors confirmed and extended the findings of Melville et al. (see preceding entry), showing that the biological effects of desthiobiotin could be classified into four groups according to the responses of the individual bacteria or fungi involved. These groups are characterized.

The possible synthesis of biotin from desthiobiotin by yeast and the anti-biotin effect of desthiobiotin for L. casei, K. Dittmer, D. B. Melville, and V. du Vigneaud (*Science, 99 (1944), No. 2567, pp. 203–204*).—Desthiobiotin proved equally as effective as biotin in stimulating growth of *Saccharomyces cerevisiae,* but could not replace biotin for *Lactobacillus casei* and at certain concentrations had a definite antibiotin effect. These differences suggested a differential bio-assay method for determining biotin and desthiobiotion in systems containing either or both. The results presented showed that desthiobiotin disappears from the incubating yeast cultures and is replaced by an equivalent amount of a substance possessing growth-promoting powers for *L. casei;* the most logical assumption is that desthiobiotin is transformed to biotin by the growing yeast cell. It is suggested that use of such a biological synthesis of biotin from the relatively easily synthesized desthiobiotin on a preparatory scale might be feasible with micro-organisms which could convert larger amounts of desthiobiotin to biotin.

Xylenoxy growth substances, P. W. Zimmerman, A. E. Hitchcock, and E. K. Harvill (*Contrib. Boyce Thompson Inst., 13 (1944), No. 5, pp. 273–280, illus. 2*).—Tests of 15 xylenoxy acids for physiological activity indicated them to be

effective when applied as aerosols, vapors, sprays, or lanolin preparations. Applied to plants, these hormonelike substances induced variable responses, some having the capacity to induce cell elongation and formative effects and others to cause only one of these two responses. The position of the substituted groups in the benzene ring apparently determines in part the activity of the molecule. Linkage between the alpha C atom of the acid and the O of the xylenoxy group appeared necessary for activity of the molecule. Plants treated with active xylenoxy acids grew modified leaves differing from the normal in size, shape, pattern, texture, and venation, these modified leaves appearing like those of virus-infected plants. The effects could not, however, be transmitted by grafting or inoculation; after the chemical influence disappeared the treated plants reverted to normal.

Some seeds showing special dormancy, L. V. Barton (*Contrib. Boyce Thompson Inst., 13 (1944), No. 5, pp. 259–271, illus. 4*).—A study of the germination behavior of seeds of *Asarum canadense*, *Sanguinaria canadensis*, *Polygonatum commutatum*, *Trillium grandiflorum*, *T. erectum*, and *Caulophyllum thalictroides* indicated all to possess epicotyl dormancy and to require exposure to 5°–10° C. after the root had formed to overcome this dormancy. Seeds of *Asarum* exhibit no root dormancy, those of *Sanguinaria* and *Polygonatum* show partial root dormancy, while those of *T. grandiflorum*, *T. erectum*, and *Caulophyllum* have both dormant roots and epicotyls. Dormant roots may be induced to develop by moist low temperature pretreatment of the seeds. Thus *T. grandiflorum*, *T. erectum*, and *Caulophyllum* seeds have a double dormancy overcome by two separate cold periods, one before the appearance of the root and the other after germination to form a root has already taken place.

Layering after a heavy snow storm in Maryland, E. L. Little, Jr. (U. S. D. A.). *Ecology, 25 (1944), No. 1, pp. 112–113*).—An opportunity to observe natural layering on a large scale was afforded by an unusually heavy snowstorm on March 29, 1942; as a result of this study a tabular summary of 250 layering plants (15 species of shrubs and trees) is presented, with discussion. Those found highly successful in rooting from the bent tops (*Viburnum pubescens*, *V. dentatum*, *Clethra alnifolia*, and *Cornus florida*) are among those which are easily propagated from untreated cuttings. Relatively few stems of *Vaccinium corymbosum* in contact with the soil formed roots. The largest plants found rooting were *Acer rubrum* and *C. florida;* the longest rooting stem of *Viburnum pubescens* was 15 ft.; the largest stem bearing roots was a shoot of this species 0.6 in. in diameter. Root systems were similar among the species except that roots of *Kalmia latifolia* and other ericaceous plants were shorter and smaller in diameter. Fourteen examples of layering that occurred before 1942 were also noted, and 10 plants not found rooting are listed.

Physiological ontogeny in the tobacco plant: The effect of varying water supply on the drifts in dry weight and leaf area and on various components of the leaves, A. H. K. Petrie and J. I. Arthur (*Austral. Jour. Expt. Biol. and Med. Sci., 21 (1943), No. 4, pp. 191–200, illus. 12*).—It is shown that when tobacco plants are subjected to drought—permanent or temporary—as compared to fully watered plants, the net assimilation rate on a protein basis is decreased and at the same time there is a greater uptake of N from the soil. When plants subjected to temporary drought are returned to high-water conditions, the net assimilation rate is restored to approximately the same value as that of the control high-water plants, but with return of the high assimilation rate the protein content of the leaves becomes greater than that of the controls, with the result that the growth rate also becomes greater. In plants subjected to permanent drought the net assimilation rate is considerably lower than that

of fully watered plants, and since the maximum protein content of the leaves is attained later than that of the fully watered plants carbohydrate content may limit protein formation. The slower growth rate delays senescence with its accompanying loss of leaf protein, so that during late harvests the growth rate of the low-water plants is greater than that of the controls.

Studies of the flax plant, I, II (*Austral. Jour. Expt. Biol. and Med. Sci., 20 (1942), No. 3, pp. 149–160, illus. 6; 21 (1943), No. 4, pp. 201–209, illus. 3*).—The following contributions are included:

I. *Physiology of growth, stem anatomy, and fibre development in fibre flax*, N. S. Tiver.—Growth of the whole fiber flax plant (Liral Crown variety) was depressed by low moisture treatment, due to a depression of the net assimilatory rate (protein basis); a very high stem-weight ratio was found. Anatomical studies indicated that the outer layer of cells in each bundle was the first to develop the characteristic thickening of the fiber cells; normally this process occurs progressively towards the inner boundary of the fiber bundle, but with low moisture the inner cells failed to thicken. Lignification of the fiber cells was first noted soon after flowering; thereafter it increased with time but was less pronounced under low moisture. At maturity low moisture treatment depressed the fiber yield by 40 percent, the fiber weight by over 20 percent. The practical implications of the data are briefly considered.

II. *The effect of artificial drought on growth and oil production in a linseed variety*, N. S. Tiver and R. F. Williams.—Growth of the whole plant in the linseed variety Punjab was depressed by low moisture treatment, and for the same reason as in fiber flax (see above). The oil yield in Punjab at maturity was decreased nearly 40 percent by this treatment, and the oil content of the seed was slightly decreased. Differences between fiber flax and linseed flax with respect to the development of plant parts and the ratios of these to the weight of the whole plant are interpreted in terms of the general principle that the distribution within the plant of carbohydrates and other metabolites is largely determined by the changing balance of demand set up by the competitive meristematic tissues. Punjab flax has a very high inflorescence weight ratio, but the stem weight ratio is greatly reduced as compared with Liral Crown. On the assumption that temperature is the limiting factor of the environment, net assimilatory rate (protein basis) was used as an inverse index of the N status of the plant. Prior to flowering the N status of fiber flax was shown to be high and that of linseed flax very high. Attention is called to the similarity of the effects of drought and of late sowing in the field; it was indicated that the data from this experiment are relevant to the interpretation of such field trials.

The osmotic quantities of the cells in the hypocotyl of Helianthus annuus seedlings, W. A. Beck and B. Andrus (*Bul. Torrey Bot. Club, 70 (1943), No. 6, pp. 563–598, illus. 5*).—The purpose of this study was to investigate the active growth of developing cells and their osmotic quantities, with the idea of correlating these phenomena and drawing possible conclusions as to the physical nature of the protoplast, the cell sap, and the wall, sunflower being the experimental plant used. Determinations were made from the time the cells ceased to proliferate to the mature state, and the work extended over a 3-yr. period. The methods used are described in detail, and a diagram of the seedlings is presented giving the dimensions and showing the zones in which the osmotic quantities of the epidermis and cortex were determined; a summary of the conditions of the cells and of the osmotic quantities in these various zones is given. It is believed that the results obtained should offer a better understanding of the nature of growth by cell enlargement and of the energies that are involved. There are 52 references.

Buffer values of the leaves of some plants, G. E. F. Brewer and E. Godar. (*Plant Physiol., 19 (1944), No. 1, pp. 164–169, illus. 2*).—The data were plotted and titration curves drawn from the pH values determined by a comparatively speedy method and from the changes in pH on addition of small quantities of acid or base. From the titration curves the buffer "β" indexes (D. D. van Slyke) were computed, plotted against pH, and the buffer index curves drawn. The data obtained for sunflower, potato tuber, and *Kalanchoe pinnata* agreed fairly well with results by other authors and methods, and data extending over a wider range of pH are here reported. The data on *Coleus blumei* indicated that its leaves are comparatively well buffered against acids but only slightly so against alkali. The leaves of *Zebrina pendula* were very slightly buffered against either acid or alkali, and the leaves of *Pseudotsuga taxifolia* contained polyvalent anions and/or several anions of distinctly different ionization constants.

Effect of p-amino-benzoic acid on the toxicity of p-amino-benzene-sulphonamide to higher plants and fungi, P. W. Brian (*Nature [London], 153 (1944), No. 3872, pp. 83–84*).—In a series of experiments connected with the control of seed-borne diseases of wheat, emergence was markedly reduced and the seedlings stunted by *p*-amino-benzene-sulfonamide but addition of *p*-aminobenzoic acid canceled this effect. Similar results were determined for the fungi *Penicillium digitatum*, *Fusarium cóeruleum*, and *Botrytis allii*. On the basis of such findings in widely separated plant groups, it is suggested that the phenomenon may eventually be found associated with some metabolic process of fundamental importance to living matter in general.

The dynamic approach to plant structure and its relation to modern taxonomic botany, E. V. Watson (*Biol. Rev. Cambridge Phil. Soc., 18 (1943), No. 2, pp. 65–77*).—A review with over 100 references.

Sôbre o recorte e asimetria da fôlha da videira [On the outline and asymmetry of grape leaves], A. Rodrigues (*Agron. Lusitana, 4 (1942), No. 2, pp. 137–153, illus. 6; Eng. abs., pp. 150, 153*).—In further work along these lines (E. S. R., 90, p. 167), the author studied the relations between foliar asymmetry and contour and their taxonomic value in differentiating hybrid grapes.

GENETICS

A cytological study of the genus Sorghum: Subsections Para-sorghum and Eu-sorghum, E. D. Garber. (Univ. Minn.). (*Amer. Nat. 78 (1944), No. 774, pp. 89–94, illus. 1*).—The genus includes species with haploid numbers of 5, 10, and 20; Snowden (E. S. R., 76, p. 785) divided it on a morphological basis into two subsections: Para-sorghum and Eu-sorghum. All species yet reported for the former have a haploid chromosome number of 5; excepting *S. halipense* (n=20), all species under Eu-sorghum have a haploid number of 10. The data from this preliminary cytological study suggests that Snowden's division is not only a sound but a natural one. If such striking differences in chromosome morphology as are found between species in the two subsections are significant, then the species in the subsection Para-sorghum have indeed played no role in the evolution of species in this genus with higher chromosomes (Eu-sorghum). Although the data are still meager, there is reason to believe that the two subsections may merit separation into two genera. No hybridization is known to occur between species in different subsections. Cytological and preliminary breeding data indicate a very close relationship among species of Eu-sorghum. Except for chromosome number, *S. halipense* differs essentially from other species of this subsection only in that it is a perennial whereas the others are

annuals; whether it is an auto- or allopolyploid has not yet been definitely determined.

The location of two genes for mature plant characters in barley in linkage group No. 1, D. W. Robertson, F. R. Immer, G. A. Wiebe, and H. Stevens. (Colo. Expt. Sta., Univ. Minn., Idaho Sta., and U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 1, pp. 66–72, illus. 2*).—Linkage relations of factor pairs *Ee* for normal v. long outer glume and *Lk lk* for awnless v. fully awned lemma were studied in relation to four other factors in chromosome I. *Lk lk* and *Vv* were completely linked. In chromosome I the gene order was found to be (*v, lk*)–*e–y–f–or.*

Crossing studies with male-sterile barley, O. C. Riddle and C. A. Suneson. (Univ. Calif. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 1, pp. 62–65, illus. 1*).—Factors discussed relative to use of a male-sterile barley stock (E. S. R., 83, p. 754) include crossing technics, fertile period for female flowers, and certain causes of variation in seed set, together with effects of such seed density differences on kernel weight.

Hybrid vigor in barley, C. A. Suneson and O. C. Riddle. (U. S. D. A. coop. Univ. Calif.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 1, pp. 57–61, illus. 1*).—When male-sterile barley (E. S. R., 83, p. 754) was used for production of hybrid seeds by mass pollination and F_1 progeny were tested later for yield and other manifestations of heterosis, the seven pollen parents crossed with male sterile differed appreciably in combining ability, with an average yield advantage over both parents of more than 20 percent. A workable method of evaluating yield-transmitting qualities of varieties through tests of their F_1 hybrids is suggested.

Crossing-over and second division segregation in fungi, F. J. Ryan (*Bul. Torrey Bot. Club, 70 (1943), No. 6, pp. 605–611, illus. 3*).—A critical review (10 references) and theoretical discussion, from which it is concluded that there is every reason to believe that in molds, as in other organisms, homologous kinetochores separate in the first meiotic division (reductionally) and each kinetochore divides in the second division (equationally).

Comparative genetics of blue plumage in poultry, R. G. Jaap and T. T. Milby. (Okla. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 1, pp. 3–8*).—A compilation of several papers indicates that to present a uniform gray or blue color the chicken, turkey, or duck must be genetically black. i. e., have a genetic factor *E* as well as possess the factor *G* for gray. It is the *E* gene which tends to disperse the pigment intensely and uniformly throughout each feather. From crosses of colored varieties it appears that white strains have arisen from other than blue varieties. Classification of several hundred progeny from different types of matings from parents homozygous and heterozygous for these genes conformed to these conclusions, with few exceptions. The homozygous *GG* chicken differs from the turkey and duck in the juvenile and adult plumage by the failure of the gray melanophores to develop definitive feathers in the chicken. Ducks differ from the other species by the production of a buff color through the action of a sex-linked dilution factor, *d*, with gray, *GG*, and non-extended black, *ee*. Heterozygous blues, *Gg*, show black flecks, not present in homozygotes. All of the black and most of the white varieties of ducks, turkeys, and chickens are homozygous for the nongray allele, *g*.

Measuring strain differences in the conformation of turkeys, V. S. Asmundson. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 1, pp. 21–29, illus. 1*).—A variance analysis of the weights and measurements of about 50 male and female turkeys at 24 weeks of age and mature females in three strains selected for egg production, conformation, and similarity to the broad-breasted type indicated that length of shank and keel and depth of body were useless for dif-

ferentiating between these types. However, positive differences were observed between weight and width of breast, which were considered adequate for differentiation. Little difference was shown for effects of different distances above the keel for measuring width of breast. Within strains differences in length of shank and keel and depth of body were determined more largely by differences in weight than by differences in breast width. Converting the coefficient of correlation to r^2, reference to total variance indicated that variations in weight influenced width of breast most and length of shank least. Direct measurements of the breast width at a definite distance above the keel were adequate to differentiate the three strains, whereas length of shank, length of keel, and depth of body were not.

Chondrodystrophy in Rhode Island Reds, F. A. Hays. (Mass. Expt. Sta.). (*Amer. Nat., 78 (1944), No. 774, pp. 54–58, illus.1*).—An abnormality probably due to faulty calcium metabolism designated as chondrodystrophy was found to occur in 16 chicks in one pen, produced with 140 normals. The abnormality involved shortening of the long bones of the limbs and the bones of the beak. When homozygous it was lethal, although many homozygous chicks hatched normally. When the dead embryos in the eggs at 22 days' incubation from hens producing chondrodystrophic chicks were examined, 14 were normal and 28 showed the characteristic abnormality.

Inheritance in lady beetles.—I, The spotless and spotted elytra of Hippodamia sinuata, A. F. Shull (*Jour. Hered., 34 (1943), No. 11, pp. 329–337, illus. 3*).—"The spotless pattern of *H. sinuata* differs from the spotted (variety *spuria*) in just one gene. The spotless type is not quite dominant; though a few of the heterozygotes are strictly spotless, most of them have reduced spotting. There is little or no overlapping of the phenotype of the heterozygote and that of the spotted homozygote. In an Oregon population, the spotless gene was present in 5 percent of the pertinent chromosomes, the spotted gene in 95 percent. Only about 41 percent of the phenotypically spotless beetles are homozygous for the spotless gene. The occasional fusion of spots, other than the pair in the middle of each elytron, in the spotted pattern has no clear genetic basis."

-Tropic versus -trophic in the terminology of the pituitary hormones, G. W. Corner, Sr. (*Endocrinology, 33 (1943), No. 6, pp. 405–408*).—A discussion of spelling, with preference for the latter suffix to the gland affected.

Bioassay of adrenocorticotropic hormone, M. E. Simpson, H. M. Evans, and C. H. Li. (Univ. Calif.). (*Endocrinology, 33 (1943), No. 5, pp. 261–268, illus. 14*).—The method of assay of the adrenocorticotropic hormone adopted by the laboratory was based on the beginning repair of the adrenals of female rats 14 days after hypophysectomy at 26–28 days of age. Four daily injections of the material tested were administered. Comparison was made of the microscopic appearance of the cortex of the adrenal 18 days after operation. The daily dose in milligrams necessary to maintain the preoperative adrenal weight for 15 days in male rats hypophysectomized at 40 days of age had several advantages. Daily doses in excess of 0.20 mg. gave complete maintenance in groups of 10 to 25 rats injected with 0.02, 0.05, 0.1, 0.2, and 1 mg.

Factors affecting the action of antigonadotropic sera in immature rats, W. H. McShan, H. R. Wolfe, and R. K. Meyer. (Univ. Wis.). (*Endocrinology, 33 (1943), No. 5, pp. 269–275*).—Antigonadotropic sera developed in rabbits and goats were more effective in preventing the gonad-stimulating action of relatively unpurified extracts prepared from sheep, hog, and cow pituitary glands when injected separately than when mixed in vitro before injection. The general results were explained by the greater gonadotropic activity per unit of dry weight of the horse, human, and rat pituitary than that of sheep, hog, and cow pituitary

glands. The action of the antisheep pituitary serum from rabbits on gonadotropins from various sources when separate and in combination was investigated.

Some influences of stilbestrol, estrone, and testosterone propionate on the genital tract of young female fowls, E. H. Herrick. (Kans. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 1, pp. 65–66, illus. 2*).—The genital tracts and comb size of 18-day-old female chicks were enlarged by intramuscular injection on alternate days with 0.5 and 0.1 mg. of stilbestrol, 0.25 mg. of estrone, and 6 mg. of testosterone propionate, as contrasted with no injection. There was no evidence of loss of weight or retardation in growth after 11 injections with stilbestrol or estrone. Photomicrographs of the cross sections of the uteri showed histological development.

Stilbestrol helps solve sterility, W. E. Petersen and W. L. Boyd (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 2, pp. 3–4, illus. 2*).—A number of sterile heifers and nonbreeder cows were brought into satisfactory milk production by injections of 20–40 mg. of stilbestrol three times per week, but some did not respond. One heifer produced 3,560.7 lb. of milk and 220.6 lb. of fat. Treatment of freemartins proved disappointing, although growth of the udders was induced in bulls and steers by stilbestrol. A bull was sterile during the treatment. The stilbestrol induced heat without ovulation. Following the withdrawal of stilbestrol treatments, spontaneous estrus and ovulation usually occurred in 1 or 2 weeks.

The breeding and artificial insemination of dairy cows in Trinidad, B. W. I., E. Harrison (*Trop. Agr. [Trinidad], 21 (1944), No. 1, pp. 3–7*).—An account of artificial and natural insemination of 350 Holstein-Friesian and Zebu cattle and cross-breeds between them.

The hydrogen ion concentration of the preputial cavity of the bull, C. K. Whitehair and B. B. Morgan. (Wis. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 14, pp. 93–95, illus. 3*).—The pH of the posterior third of the preputial cavity of 30 bulls was found to be between 6.3 and 7.4, with a mean of 6.68. Near the anterior end of the penis, it varied from 6.7 to 7.7, with a mean of 7.15. The middle third had a pH of 6.8 to 8.0, averaging 7.42.

A Single Comb White Leghorn pullet with two ovaries and oviducts, R. L. Bryant. (Va. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 1, pp. 77–78*).—A Single-Comb White Leghorn pullet with two ovaries and oviducts is described, but only the left were functioning.

FIELD CROPS

[Field crops studies in Louisiana], D. M. Seath and L. L. Rusoff (*Dairy Res. Digest [Louisiana Sta.], 2 (1944), No. 1, pp. 1, 3, 4*).—This issue contains brief notes on current work of the station as follows: Pasture Outyields Corn Crop (p. 1), Long-Time Pasture Improvement Pays Dividends (p. 2), Manure and Commercial Fertilizer Help Lespedeza, and Limed Pasture Proves Best (both p. 3), and Lime Gives Big Boost to Lespedeza, and Manure Gives Big Boost to Pasture (both p. 4).

Stepping up rotation pasture yields, A. C. Arny (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 2, pp. 1–2, illus. 1*).—Legume-grass pastures grazed rotationally at four locations yielded, on a 15-percent moisture basis, when grazed at 4-in. height a 3-yr. average of 1.61 tons of pasturage per acre; 8 in. 2.10 tons, a gain of 30 percent; and 12 in. 2.39 tons. Yields of crude protein averaged 571, 719, and 700 lb., respectively. Stands were sparser and plants much weaker on the 4-in. pastures. On most farms increased yields of from 30 to 50 percent or more may be obtained from rotation pastures by letting growth

reach 8–12 in. each time before turning in livestock. In terms of total digestible nutrients, permanent and rotation pastures produce feed at costs averaging 41 ct. per 100 lb. as compared with an average of 88 ct. for four harvested crops. Because pasture crops are harvested by livestock, labor requirements average only about 2 hr. per acre as compared to 12.9 hr. for harvested crops.

Alfalfa-bromegrass makes good pasture, J. H. HILTON, J. W. WILBUR, and G. O. MOTT (*Indiana Sta. Cir. 290 (1944), pp. [6]*).—In pasture studies during the three seasons 1939, 1940, and 1941 with a total of 21 cows, the average daily milk production on alfalfa-bromegrass pasture was 27.6 lb. and on bluegrass pasture 25.1. Cultural practices with the alfalfa-bromegrass mixture (9 lb. each of seed per acre) are suggested.

Alfalfa varieties and seed sources, H. B. MUSSER and J. K. THORNTON (*Pennsylvania Sta. Bul. 459 (1943), pp. 5+*).—Variegated alfalfas, such as Ontario Variegated, Cossack, Baltic, Hardigan, and Grimm, have been the highest yielding and winter hardiest alfalfas tested, 1934–43. Hardy common alfalfas from the Dakotas, Montana, Nebraska, and northern Kansas were next in value. Nonhardy common strains from States south of Kansas and from Argentina were lowest in yield and highest in winter killing. Respective average acre yields, 1934–36, were for variegated alfalfas tested 2.45 tons of hay, hardy-common strains 2.03, and nonhardy common lots 1.29 tons; during the period 1937–39 3.39, 2.66, and 1.82 tons; and 1941–43 2.35, 1.95, and 1.74 tons per acre.

Which barley to grow, T. E. STOA (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 3, pp. 5–12*).—Extensive variety tests indicate for malting barley Wisconsin 38 [Wisconsin Barbless], Manchuria, and Odessa for hard malting, and Plush and Kindred. For feed Trebi has been most productive, with Spartan, Tregal, and Velvon also promising. The malting barleys also may be grown for feed. Varieties tested are described, with remarks on their behavior in North Dakota.

Buffalo grass, L. E. WENGER. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 321 (1943), pp. 78, illus. 17*).—Buffalo grass (*Buchloe dactyloides*), an important crop of Kansas and the Great Plains, is a valuable source of feed in the region and is well adapted as a protective turf on military areas and for lawns. Information on this grass, detailed from prolonged station and Department of Agriculture experiments and experience (extensively reported earlier), considers botanical characteristics of buffalo grass, growth habits, and its normal variations; distribution, climatic, soil, and habitat requirements, and response to cultivation; establishing stands of buffalo grass for pasture by natural revegetation, transplanting vegetative material, treating and planting seed, seedbeds and their preparation, and seeding practices and subsequent treatment; management of buffalo grass pastures; use of buffalo grass for lawn and landscape plantings, erosion control, airfields, highway development, sports fields, and cemeteries; diseases and insect enemies of buffalo grass; improving the grass; growing the crop for seed; and seed-harvesting machinery.

Hybrid corn: Its origin and value, H. K. HAYES (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 2, pp. 7, 15–16, illus. 2*).—An account of the development of hybrid corn, with concise descriptions of objectives and methods of the station.

Illinois hybrid corn tests, 1943, G. H. DUNGAN, J. H. BIGGER, A. L. LANG, O. BOLIN, and B. KOEHLER. (Coop. U. S. D. A. and Ill. Nat. Hist. Survey). (*Illinois Sta. Bul. 500 (1944), pp. 101–124, illus. 1*).—Yields and other agronomic characteristics are reported for 208 corn hybrids grown in 1943 on seven fields and on soils of two levels of productivity. Galesburg test field had the highest average yield, 112.9 bu. per acre, and the upland field at the Dixon Springs Station at Robbs the lowest, 35.2 bu. Range in yield between different entries on the same field indicated that some hybrids significantly excelled, the general level

of yields showing that most commercial seedsmen are producing high-yielding hybrid seed corn. Nine hybrids on the same farm at Urbana averaged 100.8 bu. per acre on highly productive soil and 64.7 bu. on medium-productive soil. Size of kernel and test weight also were different on the two fields.

Southern corn rootworm caused more damage than usual early in the season, but injury later was negligible except at Galesburg, where it caused lodging in 8.9 percent of the plants. Corn borer damage caused an average of 5.6 percent of the stalks to break at Milford, Mt. Morris 4.1, and Galesburg 1.6 percent. Root rots caused considerable damage in poorly drained spots, especially at Alhambra, and diplodia stalk rot caused appreciable loss in some fields.

Of Illinois land devoted to corn production in 1943, 96 percent was planted with hybrid seed. For 6 yr. (since 1938) hybrid corn has occupied more than 50 percent of the corn acreage in Illinois, and corn yield has averaged 49.6 bu. per acre, 48 percent more than the 33.6 bu. for the 6 yr. prior to 1938, an increase largely attributed to more extensive use of hybrid corn.

Choosing corn hybrids for Indiana, S. R. Miles. (Coop. U. S. D. A.). (*Indiana Sta. Bul. 492 (1943), pp. 63, illus. 12*).—This discussion takes up factors to be considered in choosing and buying a hybrid and the overproduction of hybrids, describes all Indiana hybrids and some others, and tabulates a large number of tests in Indiana. By way of conclusion the author states that five yellow hybrids (and an equal number of white) are probably enough to fill the needs of Indiana. Five excellent yellow hybrids, in order of maturity, are Ohio M20, Ind. 210B, 416B, and 610B, and U. S. 13 (Ind. 813B). Ind. 418A and 620A are two very promising new hybrids which have been tested only 2 yr. The two white hybrids Ind. 703B and 901B are deemed much superior to open-pollinated white varieties but have not been as productive and have not resisted lodging as well as U. S. 13 (Ind. 813B), which is yellow.

The 1943 Iowa corn yield test, J. L. Robinson and F. Reiss (*Iowa Sta. Bul. P58 (1944), pp. 849–903, illus. 1*).—Report is made on the 226 section entries in the 12 fields of the 1943 test, again grown cooperatively and in the same groupings (E. S. R., 89, p. 57). Agronomic data, including yields, are tabulated for each entry, results over several years are summarized, and test conditions and methods and the season are described. The average acre yield for all fields, 83.13 bu., was 1 bu. above 1942, highest on record, while the average stand was the lowest since 1936. Lodging averaged 9.1 and dropped ears 0.2 percent compared with 16.3 and 1.2 percent, respective 9-yr. averages. The highest-performing section entries with scores in regular hybrid and experimental hybrid classes, respectively, were for the northern section Iowa Hybrid 4316, Bear Hybrid OK–29; north-central section Pioneer 341, 3301×3302 (genetics section); south-central section 218–H (Holden), 2489×2490; and for the southern section Comp. Ohio Hybrid C92, Iowa Hybrid 4020.

Ten corn hybrids listed among leaders in the test at Stoneville, P. W. Gull (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 2, p. 7*).—Leaders in acre yield in 1943 include Funk G717, 703, and 713; Louisiana Hybrids 468, 173A, 123, and 3802; Tennessee Hybrid 15, 14, and 10; and Jellicorse (open pollinated).

Hybrid seed corn production, W. Widakas (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 3, pp. 3–4*).—Increase is reported for foundation crossing seed stocks of Nodakhybrids 201, 202, 203, and 204, and for 302 and 501 (North Dakota-produced Wisconsin Hybrids 279 and 355, respectively), found superior in various respects to Falconer and Minnesota 13, open-pollinated corns.

Cotton variety tests in the Yazoo-Mississippi Delta, J. W. Neely and S. G. Brain (*Mississippi Sta. Bul. 398 (1944), pp. 8; also in Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 2, pp. 1, 2, 7, illus. 1*).—In six variety tests conducted in 1943 at six points in the Yazoo-Mississippi Delta, the leading money

value producers were Stoneville 2B, Stoneville 2C, and Deltapine 14, followed closely by Miller, Delfos 651, Rowden, and Bobshaw 1. The earliest varieties were Bobdel, and Delfos 444, 531C, and 651. Late varieties were Wilds 15, Rowden, and Deltapine 14. Outstanding in fiber strength were Wilds 15, Bobshaw 1, Bobdel, and Rowden. In regard to fiber length uniformity, Rowden, Miller, Bobshaw 1, Bobdel, and Deltapine 14 led the list.

Milkweed floss for the Navy, H. A. GUNNING (*U. S. Dept. Agr., Soil Conserv., 9 (1944), No. 9, pp. 195–200, illus. 8*).—An account of the progress of the milkweed floss program, particularly on activities centered around Petoskey, Mich., in 1943.

Vicland oats, H. L. SHANDS and B. D. LEITH (*Wisconsin Sta. Bul. 462 (1944), pp. 15, illus. 3*).—Vicland oats, a new, productive, disease-resistant variety bred in cooperation with the U. S. Department of Agriculture and first distributed by the station in 1941, was grown on about half of the total of 2,620,000 acres in oats in Wisconsin in 1943. It has increased grain production and also has stabilized yields and quality at a high level because of its protection against devastating epidemics of leaf rust. Vicland, a selection from Victoria × Richland, a cross made at Arlington, Va., in 1930, has matured July 14–23 (1937–43); has a fairly short straw, 23.5–36.5 in., with superior feed and bedding values; medium to small, open and spreading panicles; medium, well-filled kernels with light or no awns; deep yellow hulls; high test weight, as 34–36 lb. per bushel; and 3–4 mo. dormancy (E. S. R., 90, p. 181) after harvest, which lessens sprouting in the shock. It is highly resistant to loose and covered smuts, its leaves form light spots or flecks from leaf rust, and it is susceptible to certain races of stem rust that occur late in the season.

Acre yields of Vicland and State's Pride (the most commonly grown oats in southern and central Wisconsin) were, respectively, in nursery tests at Madison, 1936–43, 69.8 and 49.7 bu.; at Marshfield, 1937–41, 49.5 and 39.7; Hancock, 1938–41, 25.8 and 22.6; and Ashland, 1937–39, 37.1 and 32.4 bu., and in 1/60-acre plats at Madison, 1938–43, 72.4 and 48.7 bu. Certified-seed growers, 1941–43, reported Vicland to average 70.3 bu. and other oats in same vicinity 44.7 bu. Production of Vicland is favored by fall plowing, early seeding of about 2 bu. per acre on a firm, fairly rough seedbed, fertilized with 150–250 lb. of 0–20–20 or 0–20–10 fertilizer or equivalent on soil deficient in available P or K. Small quantities of N are desirable to increase length of straw on unfertile soils. Since the straw of Vicland stays green longer than with older varieties, harvest should be delayed until straw is yellow and moisture content of grain is reduced to 12–14 percent.

Quality, adaptability, and disease resistance of potato varieties, R. A. JEHLE and M. MCPHEETERS (*Maryland Sta. Bul. X2 (1944), pp. [19], illus. 1*).—Field tests of 23 common potato varieties, 2–10 yr., in Garrett and Worcester Counties and on smaller scales in Frederick, Prince Georges, Howard, and Anne Arundel Counties were supplemented by tests of cooking qualities.

Irish Cobbler has been the best early potato for planting in Maryland. Warba (susceptible to leaf roll) and Triumph and Earlaine (susceptible to virus diseases) are satisfactory early potatoes, but disease-free seed stock is difficult to maintain. Chippewa, maturing 7–10 days later than Irish Cobbler, and Katahdin 10–14 days later are both satisfactory medium-early varieties and may be used for early and late planting. Katahdin is better for late planting. Sequoia, a very late-maturing potato, may be expected to outyield any other variety in Maryland. Its vines are resistant to late blight and to injury from flea beetles and leafhoppers, but the tubers are very susceptible to late blight rot; it is very resistant to mild mosaic but very susceptible to leaf roll. Dakota Red, the best late variety for planting for home use at elevations below 1,000 ft., may be kept over from year

to year in home storage, and such seed stocks may remain free from evidence of leaf roll for many years. Smooth and Russet Rural potatoes, very good varieties for planting above 1,000 ft., do not usually yield as well at lower elevations as Sequoia or Dakota Red. These varieties all outyield Green Mountain and Up-To-Date, satisfactory late varieties which are susceptible to virus diseases. Sebago vines and tubers are resistant to late blight, but the vines are very susceptible to leafhopper injury. Sebago may prove to be a satisfactory late potato but outyielded by Sequoia. American Giant (White Rose) and Russet Burbank (Netted Gem) are not considered suitable for planting in Maryland due to low yields and poor quality.

The Potomac potato, according to preliminary tests, will prove a most profitable late variety. Spraying materially increased yield, yet good yields could be made in unsprayed fields due to resistance to late blight and to injury from flea beetles and leafhopper. Mesaba may prove to be a good early potato and Pontiac and Earlaine 2 to be valuable medium-late varieties. Neither Houma nor Golden seemed suitable for planting in Maryland.

Dry, mealy potatoes were found best for baking and mashing and the waxier varieties best for creaming and salads. For French fries or potato chips, mature tubers of a moderately mealy and waxy variety stored for several weeks between 50° and 70° F. are advised. Triumph, Spaulding Rose, Irish Cobbler, and Dakota Red are best steamed. Chippewa and Katahdin are especially good for salad. Smooth Rural, Triumph, Green Mountain, Russet Burbank, Sequoia, and Up-To-Date excel for baking. Irish Cobbler, Green Mountain, McCormick, Triumph, Smooth Rural, Warba, Sebago, and Earlaine are good for most general purposes. Spaulding Rose, Smooth Rural, Russet Rural, Warba, and Chippewa are very good for French fries and potato chips. Green Mountain, Smooth Rural, and American Giant are especially good for boiling. Katahdin is quite waxy, a poor baker, but fairly good for steaming and boiling.

Preliminary tests soon after harvest indicate that Potomac is excellent for baking and that Pontiac and Earlaine 2 are also good bakers. Potomac, Pontiac, and Earlaine 2 are all good general-purpose potatoes. Mesaba is good boiled pared and is also good for potato salad and creamed potatoes.

Sweetpotato culture: Varieties, spacing, date of setting, date of digging, diseases, fertilizers (*Tennessee Sta. Bul. 189 (1944), pp. 24, illus. 4*).—Experiments with sweetpotatoes are reported in the following sections:

Varieties, spacing, date of setting, and date of digging, B. D. Drain (pp. 3–7).—Nancy Hall outyielded its nearest competitor in tests at Clarksville, 1933–42, by 26.8 bu. per acre of U. S. No. 1 roots, in harmony with results elsewhere in the State. Unit No. 1 Porto Rico (Louisiana Station), 1939–42, slightly outyielded Bunch Porto Rico and a superior vining strain. A similar test, 1936–40, at Jackson, was less favorable for Unit No. 1. Unit No. 1 Porto Rico appeared fully equal to the best strain of Porto Rico at Knoxville. Bunch Porto Rico, when vining varieties are not permitted to grow over it, appeared to equal vining strains. Bunch and Unit No. 1 strains may give somewhat larger yields of U. S. No. 1 roots than three other Porto Rico selections tried at Jackson. Triumph, Nancy Hall, and Southern Queen graded well, 1929, 1931–33, at Knoxville.

Earliest plantings in 4-yr. tests at Jackson gave the largest yield; plants set in the field in June may yield only half as much as those planted in late April or early May. Good yields of marketable roots, or U. S. Nos. 1 and 2, were produced at Knoxville, 1932–33, at 9- and 12-in. spacings. August 15 appeared, in 3-yr. tests, to be the earliest digging date at which a reasonable yield could be expected. In general, the yield is larger as the sweetpotatoes are dug later. Nancy Hall outyielded Porto Rico as an early crop.

Sweet potato diseases, C. D. Sherbakoff (pp. 8–11).—Stem rot and black rot, the most important diseases of sweetpotatoes in the State, are described and control measures outlined. Nancy Halls grown from slips known to be disease free outyielded those from apparently good commercial slips. Many commercial plants died early; all disease-free plants grew until harvested.

Fertilizers for sweet potatoes, C. A. Mooers (pp. 12–17).—Fertilizer tests on P-poor soils, as uplands of east Tennessee, Cumberland Plateau, and Highland Rim of middle Tennessee, suggest use of a complete fertilizer, as superphosphate 300 lb. and potassium chloride 50 lb., applied in the row and mixed in the soil prior to bedding, and a top dressing of sodium nitrate 160 lb. (or equivalent) over the rows 7–10 days after setting out slips, i. e., a 5–10–5 formula. Superphosphate alone generally has been a very effective and profitable fertilizer. Superphosphate 200 or 300 lb. per acre may well supplement a moderate application (say 6 tons) of manure.

Experiments on soils naturally well supplied with phosphate, C. A. Mooers and B. P. Hazlewood (pp. 18–24).—Sweetpotatoes were grown at Jackson, 1932–35, on Lintonia silt loam following crimson clover and Austrian Winter peas, rye, or no cover; fertilized with superphosphate 100 lb. and potassium chloride 50 lb., plus increments of from 50 to 400 lb. of sodium nitrate per acre. Highest yields, both "total" and of Nos. 1 and 2, were obtained where legumes were turned under. No positive benefit from nitrating where legumes were turned under was shown, although total crop yields, both on fallow and after rye, increased progressively with rate of nitrating. Rye turned under was of little value compared to effects of legumes. The total crop after rye turned under was 28 bu. per acre larger than that after fallow, but there was no increase in Nos. 1 and 2. Nitrating tended to increase jumbos and culls, but even where legumes were turned under nitrating did not lower production of Nos. 1 and 2 roots, and after either rye or fallow, heavy nitrating was marked by a decided increase in the best grades. Over the period 1927–36, sodium nitrate, ammonium sulfate, cyanamide, and cottonseed meal averaged about equally as good as N carriers for sweetpotatoes. For general use on soils well supplied with P, 600 lb. per acre of an 8–5–5 mixture is recommended.

Tobacco plant production in the Coastal Plain of Georgia, J. M. Carr. (Coop. U. S. D. A. and Univ. Ga.). (*Georgia Coastal Plain Sta. Bul. 38 (1943), pp. 22, illus. 10*).—Plant bed practices described from 17 years' cooperative experiments include soils, location, preparation, fertilizers, seeding, covers, drainage, protection from cold, top dressing, and care during the transplanting season and between seasons. The best transplanting season in Georgia is between April 1 and 15, with a range of from 10 days earlier in extreme southern Georgia to 10 days later in the area around Bulloch County.

Experiments reported show the superiority of southern slopes followed by eastern or western slopes in plant production, and that beds running east and west should not be ridged lengthwise in the middle since this gives the north side of the bed an undesirable northern slope. Maximum weed control was obtained from treatment with 1 lb. of cyanamide per square yard. Fertilizer tests indicate the use of 2 lb. of 4–8–3 fertilizer per square yard, with N derived from several sources—a large proportion from organics, P in a readily available form, and K from potassium magnesium sulfate. Seedbeds in the Coastal Plain of Georgia should be sown between December 20 and January 10. Need for top dressing, as with N solutions, is indicated by slow growth of plants and/or yellowish color.

Fertilizing type 62 shade tobacco, J. L. LaPrade and J. M. Carr (*Georgia Coastal Plain Sta. Bul. 39 (1943), pp. 27, illus. 5*).—Fertilizer tests with cigar tobacco on Tifton fine sandy loam at Attapulgus, 1938–42, were concerned with

optimum quantities of N, P, K, Ca, Mg, and S, ratios of nutrients, proportions and merits of N carriers, P sources, value of manure, and effects of Cl and potassium chloride. The fertilizers used by most growers included N 250 lb., P (P_2O_5) 250, K (K_2O) 300, Ca (CaO) 100, Mg (MgO) 20, and S (SO_3) 125 lb., and a basic or normal formula carrying these quantities of plant food was set up.

N 200 lb. per acre appeared to be the optimum rate, and N 75 percent from cottonseed meal and nitrate N 25 percent and/or the N combination (cottonseed meal 56 percent, nitrate 13, urea 26, and ammonium phosphate 5 percent) gave better results than N from cottonseed meal only. Tung-oil pomace (tung meal) and stable manure were shown to be excellent substitutes for cottonseed meal. Tung-oil pomace could serve as a single N source, while manure could be used from 6 to 12 tons per acre and supplemented by additional N.

While P (P_2O_5) up to 350 lb. per acre gave small increases in yield and grade quality, the N : P : K ratio seemed as important as the amount of P, the optimum being 350 lb. of P_2O_5 per acre or a ratio of about N 1–P 1.5–K 1. Basic slag appeared to be the best P source, although steamed bonemeal and precipitated bone (or dicalcium phosphate) were also good. Superphosphate resulted in slightly reduced yields and grading quality but produced satisfactory burn and ash color. The optimum rate of K appeared to be 200 lb. (K_2O) per acre. Since inclusion of much S (SO_3) in the formula appeared to be detrimental to yield, grade quality, and burn, for best results part of the K probably should be derived from S-free compounds. Increasing the rates of Ca (CaO) had a rather slight tendency to increase yields and lower grade quality. The optimum Mg rate appeared to be 80 lb. (MgO) per acre. A ratio of from 60 to 100 lb. Mg to 200 lb. P and 300 lb. Ca per acre produced excellent ash colors and good burn. B 0.5 lb. per acre gave higher yields than none or 4 lb. The reduced burning quality of leaves from plats receiving B and highly toxic effects of excessive applications made use of B questionable, except on soils known to be B deficient. While Cl 20 lb. per acre failed to reduce burn of leaf, it showed no advantage over no-Cl treatments.

Tobacco fertilizer experiments in Dane County, J. Johnson and W. B. Ogden (*Wisconsin Sta. Res. Bul. 149 (1943), pp. 30+, illus. 3*).—Fertilizer tests, 1940–42, at Utica, near the center of the most intensive growing area in the county, on rather heavy Carrington silt loam, a typical and favorable tobacco soil for this district, were concerned with the influence of manure and different forms and quantities of commercial fertilizers on burning quality of the leaf (Havana 142). The basic formula was 3–9–18S applied 800 lb. per acre with and without manure. See also an earlier note (E. S. R., 90, p. 620).

Marked improvements in quality and leaf burn followed use of complete fertilizers (400–800 lb. per acre) and of potassium sulfate alone or with manure. Manure alone, 33 tons per acre, produced the best average yield (about 2,000 lb.) and the highest quality-index. Leaf burn ranged from about 2 to 10 sec.; greatest improvement followed the use of mineral K forms. There was evidence that manure either depressed leaf burn slightly or did not improve burn in proportion to the quantity of K supplied to the soil and taken up by the leaf. Harmful effects of potassium chloride fertilizer on burn was demonstrated clearly in leaf tests and cigar tests. Effects of manure, regarded as harmful to burning quality, are largely attributed to its Cl content. Some Cl was also shown to be supplied by the commercial grade of potassium sulfate fertilizer. Possible methods of reducing the Cl effect suggested involve chiefly conditioning of land by heavy manuring or fertilizing from 2 to 4 yr. before planting of tobacco when the land is still in some other previous cultivated

crop, as corn. This plan is based on observations that beneficial effects of K applied are retained by the soil considerably longer than is the harmful effect of Cl added. Soil and leaf analyses revealed the difficulty of either rapidly or markedly increasing available K in the soil or leaf by ordinary rates of application of manure or commercial fertilizer. Rather heavy yearly applications are needed to increase materially the K content of leaf itself and thereby improve leaf burn on such relatively heavy soils as were represented by the test plats. The results in general support the view that the heavier soils in Dane County may be maintained or so improved as to produce the higher qualities of leaf tobacco desired by the trade.

Wheats for Tennessee growers, C. D. SHERBAKOFF (*Tennessee Sta. Cir. 86 (1943), pp.* [7]).—Recommendations, based on tests with wheat varieties and selections, 1928–43, include for eastern Tennessee Forward and Trumbull (awnless), and good lines or selections of Fulcaster, as 612, V. P. I. 131, and Nittany, and Mammoth Red; from Knoxville to the Mississippi Bluestem 2, Thorne, Forward, and Trumbull; in north-central Tennessee Bluestem 2, Thorne, and Currell; in extreme southern Tennessee, Chattanooga to Memphis, Bluestem 2, Sanford, and Gasta; and for the State as a whole, Bluestem 2, Thorne, and Fulcaster 612.

Bluestem 2 (Purplestraw), an awnless Tennessee Station selection, usually outyielded other wheats tested at Knoxville and at other localities in Tennessee, but on poor land has a rather small kernel of uneven hardness. It should, therefore, be grown only on naturally fertile land, or after tobacco, potatoes, tomatoes, or any well-fertilized truck crop. The bearded Fulcaster 612, another station selection, differs from Fulcaster only in greater uniformity and better yield. It can be grown successfully throughout the State, although liable to lodge on rich land. It is of good quality even when grown on relatively infertile soil. These and other varieties are described and classified.

Agricultural seed, A. S. LUTMAN (*Vermont Sta. Bul. 506 (1943), pp. 12*).—Purity and germination guaranties and variations found are tabulated and discussed from tests of 326 samples of field crops seeds and forage mixtures secured from dealers in Vermont in 1943.

HORTICULTURE

The use of alkylation phosphate with respect to toxicity, I. W. WANDER (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 43–47, illus. 2*).—Alkylation phosphate, a product obtained by treating rock phosphate with sulfuric acid which had been used in the manufacture of high-test aviation gasolene and which contains some aromatic compounds which render the acid unfit for further gasolene processing, was compared with the usual commercial forms of 20-percent superphosphate for growing plants. Various vegetable, agronomic, and flowering plants used in the test showed no harmful effects from alkylation phosphate when used at rates considerably above those that would be employed in the field. There was no material difference in soil reaction, and both types of phosphate increased the available phosphorus in the soil.

Consejos practicos sobre huertos [Vegetable culture], J. A. B. N[OLLA] (*Agr. Expt. [Puerto Rico Univ. Sta.], 3 (1943), No. 3, pp. 2–7, illus. 2*).—Information of a practical nature is given on the preparation of the soil, methods of sowing seed, transplanting, general cultural care, protection from diseases and insects, etc.

Relation between seedling vigor and tree vigor in apple hybrids, M. J. DORSEY and L. F. HOUGH. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 106–114*).—A study was made of the growth responses of selected progenies

with fairly large numbers of individuals with a view to determining what relation may exist between height during the early years and at later stages when the trees may be coming into bearing. The conclusion reached following analysis of the data was that the correlation between height at the second year and at the ninth year was not sufficiently close to justify discarding the smaller trees at the 2-yr. stage. Apparently factors other than those which influence the 2-yr. height play a major role in determining height at the ninth year in the orchard.

He put a blanket on his orchard, F. B. Harper and G. E. Paxton (*U. S. Dept. Agr., Soil Conserv., 9 (1944), No. 9, pp. 200–202, illus. 2*).—In a walnut orchard near Walnut Creek, Calif., disastrous losses of surface soil were prevented by substituting for clean cultivation a cover crop consisting principally of Canadian field peas, purple vetch, and red oats.

Some spectral curves of maturing apples, R. V. Lott. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 59–62, illus. 1*).—With the aid of an automatic recording photoelectric spectrophotometer, changes in flesh and skin color were followed in maturing fruits of several apple varieties in 1942. The curves for flesh were fairly similar in shape, with the exception of the violet and blue regions of Cortland, the only true white-fleshed variety used. For skin color there were two general curve types, one for red and one for yellow varieties. It was hoped that the work might provide information which would aid in the establishment of definite maturing standards, since definite changes in flesh color are observable as maturity progresses.

The levulose, dextrose, and sucrose content of fifteen Illinois apple varieties, R. V. Lott. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 56–58*).—In all the varieties studied, levulose was the predominant sugar, making up more than half the total sugar with the exception of Red June, Winesap, and Willowtwig. Sucrose was second in quantity, with dextrose least abundant, comprising less than 20 percent of the total sugar except in Winesap and Stayman Winesap. There was considerable fluctuation among the varieties in the relative proportion of the three sugars. A difference was noted between Delicious and Starking, with the latter containing a higher percentage of levulose and a lower percentage of dextrose and sucrose. These data, coupled with the fact that titratable acidity of the expressed juice was twice as high in Starking as in Delicious, show that color sports may differ from the parent in other characteristics than color alone. A representative sample of 25 fruits of each variety in the stage of maturity representing optimum quality was used in the study. Further investigations were in progress on seasonal fluctuations in the several sugars in the developing apple.

Peach planting in wartime, W. P. Judkins (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 36–40, illus. 1*).—The status and outlook for peach production are discussed, with special reference to Ohio, and simple directions are presented for planning, planting, and care of young orchards. It is suggested that peach trees should not be planted unless the owner has the equipment and experience to manage the orchard properly.

Peach varieties for Ohio, W. P. Judkins (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 33–35*).—Grouped according to commercial value, information is given on a large number of peach varieties with respect to ripening date, flesh color, fruit size, freeness of stone, hardiness of the buds, etc. The five varieties included in the group of most important commercial sorts are Cumberland, Golden Jubilee, Halehaven, Belle, and Elberta.

Seasonal trend of fruit-bud hardiness in peaches, E. M. Meader and M. A. Blake. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 91–98, illus. 2*).—By means of an ice cream cabinet supplemented with additional appara-

tus which permitted either fast or slow rates of cooling, peach twigs collected at several intervals from late November 1941 to the middle of March 1942 were tested as to resistance to injury at —6° and —8° F. The lowest temperature of the winter, —2°, occurred on January 11. Artificial freezing trials on January 13 showed some gains in hardiness in Cumberland, Belle, and Golden Jubilee, and some loss in others such as Summercrest and Triogem. A general warming up in early March was followed by a very rapid and marked loss in resistance to low temperatures. It was evident that peach flower buds changed in their relative hardiness rather soon after sharp temperature changes either upward or downward. In this study the maximum resistance to cold coincided with the lowest temperature recorded during the winter. Seasonal trends in hardiness tended to be related inversely to the maximum and minimum outdoor temperatures.

Notes on variation and self-sterility in the mahaleb cherry, L. E. Joley. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 103–105*).—A comparison of two lots of mahaleb cherries, one of Russian origin and the other from the Netherlands, showed a great difference in the viability of the seeds and in the growth of the resulting seedlings in favor of the Russian material. Pollination studies with a number of mahaleb cherries showed a marked tendency toward self-sterility, suggesting that if seedlings are to be raised from selected mother trees attention must be given to suitable cross pollinizers.

Low-bush blueberries, F. B. Chandler (*Maine Sta. Bul. 423 (1943), pp. 105–131, illus. 14*).—General information is presented on the botany and distribution of the blueberry in Maine, soil and climatic requirements, production and prices, cultural operations arranged by months, harvesting, grading, marketing, etc.

Delaware versus Catawba grapes in Ohio, W. K. Steuk (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 41–42, illus. 1*).—The Delaware and Catawba varieties produce annual crops of 100 and 800 tons per acre in favorable years in Ohio. On an acre basis, the Delaware is thus much the less productive, a fact that offsets its higher price per ton. Apparently wherever Catawba grapes can be ripened, they should prove more profitable than Delawares and should be chosen for planting.

Some instances of scion dominance in Citrus, R. W. Hodgson and S. H. Cameron. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 131–138, illus. 2*).—In these experiments, in all cases the rootstocks consisted of carefully selected seedlings of nucellar origin from single parental trees and the scions were taken from single mother trees. In reciprocal combinations of rough lemon and trifoliate orange, a pronounced dwarfing effect of the trifoliate orange was evident whether used as scion or stock. Rough lemon, on the other hand, increased the weight of trees whether used as root or top.

In an experiment in which Marsh grapefruit, Valencia orange, Washington Navel orange, and Eureka lemon were all budded on sweet orange, the Marsh grapefruit and Valencia orange trees were markedly more vigorous than the other two groups. When the roots were weighed, those of the Valencia orange and the Marsh grapefruit were consistently larger. In these combinations the scion had played the dominant role in determining size of both the tree and the root. In another experiment in which 11 sour orange clones were budded on the same sweet orange, there was a great difference in the vigor of the resulting trees and in the growth of the root systems. The scions had exerted a profound influence on the development of the trees. The data support the conclusion that in citrus trees the scion determines the rate of growth and ultimate size of the tree when the vigor of the scion is less than that of the rootstock.

Seasonal changes in the juice of the calamondin in Florida, J. R. Winston. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 84–90, illus. 2*).—The calamondin, described as the hardiest of all the edible acid citrus fruits grown in Florida, ripens from late fall to midspring when the more common acid fruits, such as limes and lemons, are out of season. The rind color changes from deep green in early fall through orange to tangerine in winter. The total soluble solids, total acid, and under certain conditions the ascorbic acid contents of the calamondin increase with advancing maturity. Juice color changes from orange to deep orange or tangerine with advancing maturity. The degree of acidity is such that the fruit may be eaten whole like the kumquat, and the rind oils are not irritating to the mouth.

The effect of certain environmental factors on the growth of Cattleya orchids, J. Montgomery and A. Laurie (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 48–55, illus. 2*).—Cattleya orchid plants grown in haydite and watered with nutrient solution produced more flowers than did comparable plants grown in osmunda fiber supplied with water alone. In a second experiment, plants potted in osmunda fiber were watered with a nutrient solution. Here the results, although somewhat conflicting, gave indications of the benefit of a fertilizer solution when supplied at the right season. When plants were supplied with water of pH 4, 6, and 8, both leaf growth and flower production were best in the plats watered at the pH 6 level. Four hybrids were grown under three intensities of light, and the greatest growth and the most flowers were recorded in the high-light intensities. Attempts to influence the growth of Cattleya orchids by manipulating the photoperiod were inconclusive, suggesting the absence of a definite photoperiod effect or the failure to supply proper conditions in the experiment.

Garden roses, C. E. Wildon (*Michigan Sta. Spec. Bul. 222, rev. (1944), pp. 60+, illus. 23*).—In the same general manner as in the earlier publication (E. S. R., 67, p. 533), this presents information on soils and their preparation, planting, cultural care, winter protection, propagation, pruning, types and varieties, diseases and their control, insects and their control, historical information on the development of types and varieties of roses, tabulated lists of varieties, etc.

Chinese elm injury in 1942, E. J. George. (U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 3, pp. 27–32*).—In September 1942 there occurred a freeze with a record low of 4° F. at Parshall, N. Dak., with minimums in other parts of the State ranging from 10° to 22°. Because of favorable growing conditions prior to this storm, the vegetation was immature. Severe injury resulted to Chinese or Siberian elm and other commonly planted species, such as Russian-olive, green ash, and American elm. In certain places where fall moisture had been limited and maturity was more advanced, Chinese elm suffered less than in more favored localities. Chinese elms that were not drastically injured showed great powers of recovery the succeeding year. The author believes that Chinese elms should continue to be planted, but not in pure stands or as street trees. In mixed stands the Chinese elm should not constitute more than from 15 to 20 percent of the plantings.

FORESTRY

Cutover forests ask only a chance, J. H. Allison (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 2, pp. 11–12, illus. 2*).—A century ago northern Minnesota was covered with a magnificent forest which was sacrificed in uncontrolled logging operations and subsequent fires. At present lumber production is only about one-twelfth of that attained at the peak of operations.

Agricultural settlement has occupied only about 9 percent of the total cut-over region, with the greater part covered with brush or low-grade forests. Observations in the Chippewa National Forest and in the University of Minnesota Forest near Cloquet show the possibility of restoring the forests to a productive condition within a reasonable period. The restoration of the forests would mean increased labor opportunities; increased returns to loggers, landowners, and railroads; and recreational facilities for summer people.

Stumpage and log prices for the calendar year 1942, H. B. Steer (*U. S. Dept. Agr., Statis. Bul. 79 (1944), pp. 128+, illus. 6*).—In the usual manner (E. S. R., 89, p. 221), tabulated information is presented on total stumpage and log sales for the Nation as a whole and for the individual States, supplemented with other information as to prices, species utilized, etc.

DISEASES OF PLANTS

Phytopathology—1867–1942, G. M. Reed (*Torreya, 43 (1943), No. 2, pp. 155–169*).—An address presenting the high points of general phytopathological history for the period and with special reference to life history and classification of the fungus pathogens, physiologic specialization, environal factors, diseases due to bacteria and other organisms, virus diseases, disease resistance, disease control, and research and teaching.

The measurement of plant diseases in the field (*Brit. Mycol. Soc. Trans., 26 (1943), pt. 3–4, pp. 172–173*).—Various methods of estimating the extent of virus disease in potato and sugar-beet crops and of fungus diseases in cereals have been tested by the British Mycological Society's Plant Pathology Committee, and those recommended for use in survey and other work are here briefly summarized.

Plant viruses and virus diseases, F. C. Bawden (*Waltham, Mass.: Chron. Bot. Co., 1943, 2 ed., rev. [and enl.], pp. 294+, illus. 55*).—In this edition of the work previously noted (E. S. R., 82, p. 202), an attempt has been made to include all new studies insofar as available; more than half of the chapters have been rewritten and all have been modified to some extent. The most extensive alterations have been in those portions dealing with the properties of viruses and with their insect vectors. The arrangement of subject matter in the main follows that of the first edition.

Viruses in relation to the growth of plants, L. O. Kunkel (*Torreya, 43 (1943), No. 2, pp. 87–95, illus. 9*).—An address summarizing the subject, with 11 references.

Studies on the spread of certain plant viruses in the field, K. M. Smith (*Ann. Appl. Biol., 30 (1943), No. 4, pp. 345–348, illus. 2*).—Studies of the spread of viruses—potato X and Y and cucumber mosaic—in the field are described, using tobacco as the experimental host. The plants were set out in the form of a cross, one series with the leaves in contact and one with the leaves not touching. No spread of the X virus was observed, but there was an extremely rapid permeation of the Y virus throughout the plats and a much slower spread of the cucumber virus.

The Plant Disease Reporter, [January 1 and 15, 1944] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr., 28 (1944), Nos. 1, pp. 36, illus. 3; 2, pp. 37–62, illus. 6*).—The following are included:

No. 1.—Bean diseases in Colorado in 1943, by W. J. Zaumeyer; fungicidal dusting of tomatoes applicable to home gardens, and results of vegetable seed treatment, in Arkansas, 1943, both by H. R. Rosen; potato storage diseases in New Hampshire, Vermont, and Minnesota, dry rots of stored rutabagas in Minnesota, squash storage diseases in New Hampshire, and diseases of sweetpotatoes in

storage in Illinois; spinach diseases in Oklahoma, by D. A. Preston; nematode survey in Florida, by A. L. Taylor; diseases in winter vegetable-growing areas (Fla., La., Tex., Calif.); extensive frost damage in the South; nut diseases in the Pacific Northwest in 1943, by P. W. Miller; apricot diseases in the Santa Clara Valley in 1943, by C. E. Yarwood; Fermate spray for controlling cranberry field rots, by R. B. Wilcox; and alcoholic flux or white slime flux of tung trees, by J. R. Large.

No. 2.—Standardization of plant disease surveys, by C. M. Haenseler; late blight on potato and tomato in southern and western areas; potato storage diseases in Massachusetts, onion storage diseases in Massachusetts and Idaho, and storage rots of squash in California; nematode survey in Florida, by A. L. Taylor; vegetable diseases in winter truck crop areas (Fla., Tex., Calif.); and brief notes on diseases of citrus fruits in the Texas winter garden area, cereal crops and winter legumes in central Texas, and on diseases of barley in the coastal area of central California.

Principales enfermedades de origen parasitario que fueron objeto de consulta en el semestre Julio–Diciembre de 1942 [Principal diseases of parasitic origin which were the object of consultation during July–December 1942] (*Bol. Sanid. Veg.* [*Chile*], *2* (*1942*), *No. 2, pp. 152–155*).—The tabulation includes the Latin name of the parasite, common name of the disease, Latin and common names of the host, Chilean locality, date, and part of the plant affected.

Observations on the genus Myrothecium Tode.—I, The three classic species, N. C. Preston (*Brit. Mycol. Soc. Trans., 26* (*1943*), *pt. 3–4, pp. 158–168, illus. 17*).—The author's attention was first called to the genus several years ago through finding *M. roridum* to be an active parasite of cultivated violets. Here he presents a historical account of the genus, the type species *M. inundatum*, and of *M. verrucaria;* studies of living material of *M. roridum;* and emended descriptions of the genus and the three above species.

Alguns fungos do Brasil (Phycomycetos) [Some fungi of Brazil (Phycomycetes)], A. P. Viégas and A. R. Teixeira (*Bragantia, 3* (*1943*), *No. 8, pp. 223–269, illus. 26*).—Some 31 fungi (mostly pathogenic to plants) are considered, including brief descriptions, case records, and copious illustrations.

On germinating the oospores of Phytophthora cactorum, E. Blackwell (*Brit. Mycol. Soc. Trans., 26* (*1943*), *pt: 3–4, pp. 93–103*).—An address reviewing the literature (16 references), including work by the author. It appears that dormancy in these oospores may be attributed to several causes, among them incomplete maturation, incomplete dormancy, mechanical resistance of the oogonial wall, and impermeability of the outer oospore wall; these causes are reminiscent of dormancy in seeds. Investigators of both spores and seeds have pointed out that the germination is in part controlled by the conditions under which development took place and by the conditions of storage. Both seeds and spores may pass into a state of secondary dormancy if preparation for germination has begun and been interrupted. Use of chilling to break dormancy is well known for seeds as well as spores; it may act mechanically in producing minute cracks in the impermeable wall layers, or chemically by encouraging reactions that proceed best at temperatures above freezing point. The high complexity of this spore and the difficulty of defining the exact conditions of germination are emphasized. The biochemist, biophysicist, and student of cell-wall structure must finally answer the questions: What are the precise conditions under which water is at last permitted to enter the spore, and how does the chilling help?

Studies in the mechanism of fungicidal action.—VI, Water, A. F. Parker-Rhodes (*Ann. Appl. Biol., 30* (*1943*), *No. 4, pp. 372–379, illus. 2*).—In continua-

tion of this series (E. S. R., 90, p. 203), theoretical deductions are made from the application of the theory of variability to hydration effects, concerning the effect on variability of a given population of spores to acid and alkali poisoning of varying the isotopic composition of the H. In the former case variability should decrease and in the latter increase with increasing deuterium (D) content. It is predicted that depolymerization of the water should decrease the variability of a given population of spores to any strongly hydrated ion, such as metallic cations. Experimental technics used in applying in vitro methods of exact toxicological investigation to solutions containing excess D, and thus available in limited supply, are described. The results of experiments designed to verify the theoretical deductions above noted are recorded, and the expected trends noted. The importance of hydration effects in practice is stressed, and evidence is adduced that nontoxic electrolytes exert a direct desolvative effect on H ions.

"Fermate"—a promising fungicide, W. H. TISDALE (*Va. Fruit, 32 (1944), No. 1, pp. 36–40*).—A general discussion, with summaries by crops, of some of the diseases which it is said to control.

Über ungleiche Beizempfindlichkeit der Sporen verschiedener Brandpilze [The unequal susceptibility of the spores of various smut fungi to disinfectants], J. KIŠPATIĆ (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 522–523*).—A note on the reactions of spores of *Tilletia tritici*, *Ustilago hordei*, *U. avenae*, and *Sphacelotheca panici-miliacei* to Ceresan, Germisan, Fusariol, and Abavit as liquid disinfectants.

Studies upon the copper fungicides.—VI, The solution of copper from bordeaux and burgundy mixtures, R. L. WAIN and E. H. WILKINSON (*Ann. Appl. Biol., 30 (1943), No. 4, pp. 379–391, illus. 1*).—In continuation of these studies (E. S. R., 89, p. 452), the soluble Cu content in freshly prepared bordeaux (4–4–50 used in all tests) was of the order of 7 p. p. m.; after 10 days in absence of air it fell to 0.7 p. p. m. The dried deposit on glass yielded about 0.5 p. p. m. of Cu to water. With increasing alkalinity, the soluble Cu in freshly prepared burgundy mixtures decreased to a minimum of about 3 p. p. m. and then rose again; this effect was not observed with dried deposits, which yielded consistently less Cu to water. The amounts of Cu dissolved by water from dried bordeaux on runner bean leaves were slightly greater than on glass; these results cannot be taken as positive evidence that leaf excretions were involved, since detached leaves were used and the influence of bacteria could not be eliminated. Aqueous suspensions of *Neurospora sitophila* spores and filtrates therefrom dissolved Cu from dried bordeaux deposit in excess of the amount dissolved by water, though these quantities as well as the amounts of soluble solids in spore filtrates were appreciably less than reported by other workers in similar studies. Steam sterilization of spore filtrates had little effect on their capacity to dissolve Cu from dried bordeaux. The temperature of the spore suspension was a factor, though the substances capable of dissolving Cu were rapidly yielded to water. The nutrient agar on which the fungus was grown influenced the amount of soluble solids in the spore filtrate and its capacity to dissolve Cu from dried bordeaux deposit.

Study of the solvent properties of solutions of pure chemicals of many types indicated that Cu could only dissolve from the dried bordeaux deposit by a mechanism involving complex formation. Active substances included amino, hydroxy, and certain dicarboxylic acids and their salts, all of them possible constituents of spore exudate. Results with carbohydrates showed that such substances are not involved in liberating soluble Cu from this fungicide.

A hypothesis on the mechanism of fungicidal action of Cu, based on these findings, is presented. This assumes that Cu dissolves from the deposit under

the influence of excretions from the fungus spore and that the cupri-complexes produced are the means by which soluble Cu is transported to the spore wall. Dissociation of these complexes then make it possible for the active toxicant to be removed by the spore, thus enabling any reversible reactions involved to continue.

Panaschierung und Weissährigkeit von Getreidepflanzen und Wildgräsern als Folge klimatischer Einwirkungen [Variegation and whitening of the inflorescences of cereal plants and wild grasses as a result of climatic influences], G. Gassner (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 397–426, illus. 28*).—The author discusses these abnormal conditions as they occurred in Anatolia in the early summer of 1939; their distribution and economic significance; the influence of site, soils, seeding time, and varietal characters; whitening due to smut infection; and climatic influences as causes. It is concluded that these abnormalities were not due directly to cold or frost in the usual sense. The appearance of these symptoms is attributed to the subjection of relatively advanced plants during the latter part of the winter to temperatures around or below the minimum for growth. Under these conditions the relatively less advanced parts of the plant are believed to have lost their capacity for developing chlorophyll. This interpretation was confirmed by the temperature curves of the preceding winter, as well as by the author's previous studies on oats. Observations on the influence of seeding time and on the absence of white ears under conditions of high soil moisture in parts of the same fields are also confirmatory.

[Seed treatment effects on low germinating barley], W. E. Brentzel (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 3, p. 32*).—In a 1943 test Spergon, DB 1452, and Arasan did not increase the emergence, and Ceresan caused only a slight increase.

Note on the occurrence of Ophiobolus graminis Sacc. var. avenae E. M. Turner in Scotland in 1942, S. D. Garrett and R. W. G. Dennis (*Brit. Mycol. Soc. Trans., 26 (1943), pt. 3–4, pp. 146–147*).

Field tests of the differential reaction of wheat varieties to root rot, L. E. Tyner and W. C. Broadfoot (*Sci. Agr., 24 (1943), No. 4, pp. 153–163*).—This is a progress report on the relative resistance over several years of 148 varieties and strains of spring-habit wheat to the root-rotting fungi *Ophiobolus graminis*, *Helminthosporium sativum*, and *Fusarium* spp. under field conditions and on problems associated with testing for this resistance. The varieties and strains were found to fall rather consistently into different resistance groups. The results indicated it to be very important that data on resistance be recorded from about 4–7 days prior to maturity because if delayed the natural differences may easily become indistinguishable. Furthermore, notes should be taken on varieties of different ripening habit at the same relative stage of maturity. Presence of dry soil conditions markedly complicates the interpretation of infection symptoms.

Root-rots of certain non-cereal crops, G. H. Berkeley (*Bot. Rev., 10 (1944), No. 2, pp. 67–123*).—This is a comprehensive review (347 references) of investigations on the root rots of woody perennials, tobacco, cotton, sugar beets, peas, vetches, clovers, sugarcane, corn, pineapple, flax, soybean, broadbean, ginseng, strawberry, raspberry, vegetables, and herbaceous ornamentals. Also given special attention are temperature, soil reaction, and soil moisture in relation to root rot; types of root rot; control by varietal resistance, crop rotations, biological methods, fertilization and organic manures, soil disinfection, ringing, felling, barriers, and miscellaneous measures; and trends in research.

Research on cereal root rots has recently been summarized (E. S. R., 85, p. 632).

Resistencia al nemátode del tallo de diversas líneas y procedencias de alfalfas [Resistance to the stem nematode of various lines and derivations of alfalfa], A. E. RAGONESE and P. R. MARCÓ (*Rev. Argentina Agron., 10 (1943), No. 4, pp. 378–384*).—Studies of *Anguillulina dipsaci*.

Anthracnose: A serious disease of broomcorn in Illinois, B. KOEHLER (*Illinois Sta., 1943, pp. 5+*).—Leaf spotting, root rot, and stalk rot of broomcorn, apparently attributable to *Collectotrichum graminicolum* and resulting in losses up to 90 percent in Illinois fields in 1941 and abandonment of some fields in 1942, are cited as probable major factors in reducing State production from 9,100 tons in 1940 to 2,900 tons in 1942. The symptoms are described. The results of soil tests do not point to P or K deficiency or pH as related to disease severity. White Italian broomcorn and Scarborough Dwarf were found less damaged than Black Spanish, though sometimes severely injured. Soil inoculation experiments indicated late September or October breaking down of about a third of the plants in the inoculated plats due to stalk rot, while all stood up in the check plats.

Die Topallik-Erkrankung der Baumwolle [The "Topallik" disease of cotton], G. GASSNER (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 518–521, illus. 5*).—In the extensive cotton districts south of Adana and Tarsus in southern Turkey, the author observed a condition designated by the growers as Topallik disease, characterized by lack of roots and the consequent drying up of the plant. The malady is ascribed to an abnormal rise in the salt content of the soil during the summer drought.

Potato diseases. (Partly coop. U. S. D. A.). (*Maine Sta. Bul. 420 (1943), pp. 419–452, 471–481, illus. 1*).—Reports of progress are included on the following subjects: Bacterial ring rot due to *Corynebacterium sepedonicum* (planting of seed stock with trace of infection, resistant varieties and the mechanism of resistance, laboratory determination of susceptibility, isolation of the bacteria from rotting potatoes and use of litmus milk for culture, serological tests, survival of the organism under various conditions, and effects of disinfectants and bacteriostatic agents); leafroll, including net necrosis (resistant varieties, selection for resistance to net necrosis and its ratio to leafroll in Green Mountains, storage conditions v. net necrosis, mahogany browning and leafroll, tests for leafroll virus in tubers, control of aphids—four species involved—and infected weeds as a means of reducing leafroll, harvest time v. leafroll spread and machinery for early harvesting, and fertilizers and crop rotation as regards net necrosis development); foundation potato seed stock; determination of probable amount of disease in Florida stocks to be grown in Maine and entered for certification; greenhouse test of all Chippewa acreage entered for certification in 1942 crop season; stem-end browning as affected by storage temperature, clear v. browning seed, seed source, size of seed tubers, date of harvest, boron deficiency, copper content of tubers, chloride content of stems, seed spacing, crop rotation, and fertilizer constituents and rates of application; virus as a possible cause of stem-end browning; late blight control in relation to potato refuse piles, effect on yield and control of reducing the copper and lime content in bordeaux, different copper fungicides and bordeaux formulas at various concentrations, and noncopper spray fungicides; copper in combination with rotenone for controlling potato diseases and insects; possible etiology (organism or virus?) and control of purple top; and potato seed disinfection. Much of the data on the above diseases are also summarized in 18 tables in an appendix.

Über die Nekrobiose der Kartoffeldunkelkeime [Necrobiosis of potato sprouts in darkness], R. DOSTÁL (*Phytopathol. Ztschr., 14 (1943), No. 5, pp.*

484–496, illus. 4).—When potato tubers were germinated in darkness without outside nutrient supply their sprouts regularly succumbed to a necrobiosis which manifested itself in browning of the elongation zones and later death of the tips. This condition was found due to a K deficiency with excess of growth substances, as shown by the fact that a K paste inhibited its development and a heteroauxin paste favored it. It is concluded that influences proceeding from the roots delay the development of necrobiosis but that those arising from the mother tubers favor it.

Versuche zur Einschränkung des durch Viruskrankheiten hervorgerufenen Abbaues der Kartoffel durch anbautechnische Massnahmen [Investigations on the restriction of virus degeneration of potatoes by methods of culture], G. Sessous and L. Pielen (*Jour. Landw., 89 (1942), No. 1, pp. 32–48, illus. 5*).—In experiments (1938–39) designed to restrict virus infection of potatoes by culture methods it was found that under conditions (weather, location) most favorable to transmission as regards distance from infection foci, changes in planting and harvesting time, or changes in the direction of the rows, the total amount of infection could be influenced. On the other hand, there was a building up of differences in the severity of infections, that is, in the proportion of severe cases, differences in part considerable and conditioned by methods of culture. With increasing distance from the infection focus the severe cases decreased fairly uniformly up to the tenth row and the yields correspondingly increased; from the tenth row on the differences were obliterated. Time-of-harvesting tests showed no more favorable results from early than from late harvesting. This situation is referred to the especially early and heavy infection of the preceding season. Growing a second crop brought about a higher incidence of severe cases of infection. The direction of planting resulted in considerable differences in the proportion of severe cases and in the yields at harvestime, differences ascribable only in part to wind velocity and direction.

The reactions of potato varieties to viruses X, A, B, and C, G. Cockerham (*Ann. Appl. Biol., 30 (1944), No. 4, pp. 338–344, illus. 9*).—The reactions of 146 potato varieties to graft infection with potato viruses X, A, B, and C are tabulated and discussed in detail on the basis of their top-necrotic or nonnecrotic symptoms. Evidence is presented that the viruses B and C used in this study were uncontaminated with other viruses. Reference is made to the effects of varietal reaction on virus distribution.

Molds injurious to soybean seed, I. W. Tervet (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1943), No. 1, pp. 13–14, illus. 4*).—This study indicated ripe soybeans with low moisture content and kept in good storage to have very few seeds infected with fungi, but frost-injured samples were infected with molds and bacteria. In storage tests, the germination was lowered with increase in number of seeds infected with *Aspergillus*, but when such seeds were treated with a fungicidal dust (e. g., organic mercurials or Arasan), normal vigorous seedlings developed. This work showed that at least three members of the *Aspergillus* group—including *A. flavus*—may affect the germination and vigor of soybeans.

Flue-cured tobacco diseases (*Georgia Coastal Plain Sta. Bul. 36 (1943), pp. 43–48*).—This progress report summarizes a tobacco disease survey for 1942 and briefly reviews progress on downy mildew (blue mold) control work using yellow copper oxide-cottonseed oil, bismuth subsalicylate, and Fermate sprays and gas treatment; and root knot control in seedbeds and fields, including crop rotations.

Ten years of carrot spraying with various copper-containing materials, J. D. Wilson (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 63–73, illus. 1*).—Leaf blights

due to *Cercospora apii carotae* and *Macrosporium carotae* have become increasingly common in Ohio during the past 15 yr. In the 10-yr. control experiments, bordeaux (8–8–100 or 6–6–100) has consistently given results at least as good as from fixed coppers or organics, and in 13 of the tests including both fixed coppers and bordeaux the latter has been at the top seven times. Among the plats treated with fixed coppers the yield differences were rarely great enough to be statistically significant. Because of foliage injury, plats treated with Cuprocide (7 yr.) failed in most cases to yield as well as those treated with other materials. Whenever 50 percent or more of the foliage on controls had been killed by disease at the time of the last spray, bordeaux and many other materials showed a significantly better yield at harvest, but if defoliation in the controls was less than 10 percent at harvest the treated plats usually exhibited a decreased yield. The weight of carrot tops from treated plats was frequently two or three times that of controls; crown rot was usually most common in the latter. Use of wheat flour and other adhesives as spray supplements appeared questionable. Spraying proved somewhat more practical than dusting against leaf blights, though dusting is not ruled out from further consideration. The range between disease control and host injury appeared very narrow; bordeaux was less likely to cause injury than many of the fixed coppers at comparable Cu concentrations. In the 2 yr. tried, Fermate gave good control of the leaf blights but induced mild foliage injury which reduced its ability to increase yields by disease control. Other organics tested have not thus far proved outstanding, and S failed to give satisfactory control in the few tests made. Limited tests indicated that the Cu content of carrot sprays cannot be decreased much below a metallic Cu equivalent of 1.5 lb. per 100 gal., and neither is much gained by making the intervals between sprays less than 9 days. Results as a whole indicate that bordeaux (6–6–100) will give satisfactory control of leaf blights. Furthermore, many of the fixed coppers, particularly the basic sulfates, may be used (3 lb. to 100 gal. when the Cu content is 50 percent, and at 150–175 gal. per acre) if more convenient. The first application should be made when the tops are 4–6 in. high, followed by others at 10-day intervals until about 2 weeks before harvest. A wetting agent is needed in most of the fixed coppers.

La Septoriosis del apio en Chile [Septoria leaf blight of celery in Chile], F. Mujica R. (*Bol. Sanid. Veg. [Chile], 2 (1942), No. 2, pp. 140–143*).—A brief account of the hosts (celery, celeriac, and *Apium nodiflorum*), common names, symptoms, the fungus (*S. apii-graveolentis*), and control of the disease in Chile.

An abnormal growth on mushrooms, W. A. R. Dillon Weston and R. E. Taylor (*Brit. Mycol. Soc. Trans., 26 (1943), pt. 3–4, pp. 144–145, illus. 1*).—Description of a knoblike intumescence developed on the pileus of a mushroom and comparisons with similar diseased or teratological growths referred to in the literature.

The occurrence of Botrytis spp. on onion leaves, with special reference to B. squamosa, C. J. Hickman and D. Ashworth (*Brit. Mycol. Soc. Trans., 26 (1943), pt. 3–4, pp. 153–157, illus. 4*).—A dieback of onion foliage characterized by pale spotting and death of the leaves from the tip downward was investigated in 1941–42. Of the three species of Botrytis isolated, *B. squamosa*, recorded for the first time in England, was the predominant species, the others being an unidentified form and *B. cinerea*. Infection was limited to fall and winter, and plants usually grew away healthy in spring and summer. The disease is believed to be an example of facultative parasitism.

Further observations on the control of tomato anthracnose, J. D. Wilson (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 56–63*).—The promising results with Fermate on anthracnose control (E. S. R., 89, p. 86) were confirmed, and further tests

made on concentration and dosage. Severe defoliation by early blight encouraged a heavy infestation of anthracnose on the Huelsen variety, but control of defoliation by early copper sprays helped to reduce this type of infection. Sprays causing host injury seemed to encourage anthracnose on the fruits. Post-treatment protection against anthracnose carried over for a longer period with comparatively early spray schedules (July 20–August 30) than with later treatments, suggesting that any reduction in primary inoculum is important. The timing of the spray schedule should be altered somewhat on early- and late-maturing varieties for best results, suggesting that perhaps the stage of fruit development should be accepted as the criterion, with the first application when fruits of the first cluster are one-half to three-fourths their normal maturity size. Copper-containing fungicides were definitely less effective than Fermate in controlling anthracnose, and neither were they wholly successful when mixed with Fermate in the same tank or alternated with it in successive applications. Use of certain supplemental materials with fixed coppers to obtain better control of fruit rot was encouraging. Sprays and dusts gave comparable results against anthracnose; the best results will probably be obtained by spraying (2–100) or dusting (10–90) with Fermate—five treatments at 10–day intervals, with the first when the fruits of the cluster are about two-thirds developed.

Studies in the physiology of host-parasite relations.—IV, Some effects of tomato spotted wilt on growth, B. J. Grieve (*Austral. Jour. Expt. Biol. and Med. Sci., 21 (1943), No. 2, pp. 89–101, illus. 7*).—Bronzing symptoms were shown to be associated with a significant depression in dry weight, height, leaf area, leaf development, and water content of infected plants as compared with controls. Mottling symptoms were accompanied by a less serious depressant effect on dry weight and growth, since height was unaffected. Evidence is given to indicate that, at least in part, the virus exercises its effect on growth in dry weight by partial destruction and reduction in efficiency of assimilating tissue and on height by destruction of growth hormone. Under the experimental conditions, no relation was found between growth rate of seedling plants and incubation period of the virus. Analysis of data from growth and infection experiments indicated that factors such as growth rate, host metabolism, and relative virus activity conditioned the symptom expression.

Factors influencing infection of the tomato by Verticillium albo-atrum, F. M. Roberts (*Ann. Appl. Biol., 30 (1943), No. 4, pp. 327–331*).—Infection was encouraged by applying nitrogenous manures; phosphate had no significant effect on the progress of the disease, but a potash deficiency tended to encourage it. Steam-sterilized soil inoculated immediately after treatment produced a very high total of infected plants, but when inoculation was delayed for 17 days or longer afterward the steamed soil was no more favorable to the disease than untreated soil. Spread of the fungus from roots of infected to those of neighboring healthy plants was hastened by killing the infected plants.

The effect of a chemical soil sterilizing agent on the subsequent development of tomato plants, J. H. Western and R. Stewart (*Ann. Appl. Biol., 30 (1943), No. 4, pp. 370–372, illus. 2*).—An account is given of the effect on plant development of a chemical soil sterilizer containing orthochlorobenzene and an emulsifying agent of the sulfonated type. The symptoms are described, and an account is given of an experimental study of the effect of the treatment on growth and yield—the latter being considerably decreased. The injurious ingredient was shown to be the orthodichlorobenzene.

A crown rot of young apple trees apparently new to this section, C. F Taylor. (U. S. D. A.). (*Mountaineer Grower, 15 (1944), No. 151, pp. 11, 13*).—This is a preliminary report of the occurrence of a root-bark rot of young apple

trees in Virginia and certain counties of West Virginia. The appearance of the cankers resembled those observed in British Columbia and there ascribed to *Phytophthora cactorum*. In a survey of 35 orchard blocks, well over 1,000 trees were found killed by this crown rot in 1943 and all observed outbreaks were in the 5- to 10-yr. age class of orchard. The next most important cause of tree mortality was root girdling by mice, and black rot (*Xylaria mali*) was a cause of death in 10 of 14 replacement blocks and in 6 of 21 blocks on new sites. Few of the trees had been killed by other agencies.

Controlling cedar rust with fungicides, A. B. Groves. (Va. Expt. Sta.). (*Va. Fruit, 32 (1944), No. 1, pp. 33–36*).—A summary of work on control of cedar rust in apple orchards, with presentation of data from experiments (1943) in which Fermate gave excellent control. These trials need to be extended before definite recommendations can be made, but the method offers great promise where destruction of the alternate host (cedar) is not feasible.

[Root knot nematode studies] (*U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1943, pp. 215–216*).—Demonstrations of physiologic races of this nematode and of reduction of its damage to peach orchards by resistant cover crops are briefly noted.

Sunburn of Malta and Sangtra oranges, B. S. Bajwa and A. Ram (*Indian Farming, 4 (1943), No. 4, pp. 182–183, illus. 3*).—Experimental results demonstrated that the greater part of the injury observed on fruits of these oranges was due to sunburn; this was avoided by planting rows of sesban (*Sesbania aegyptiaca*) on the southwestern side of the trees.

La presencia de "Cylindrocladium scoparium" en la Argentina, C Jauch (*Rev. Argentina Agron., 10 (1943), No. 4, pp. 355–360, illus. 4; Eng. abs., pp. 359–360*).—This fungus observed infecting yerba maté was determined to be the same species that attacks rose, eucalyptus, and apricot. Its morphological characters are described, and the successful inoculations and cross-inoculations with the cultures isolated are detailed.

A disease of lilies caused by Fusarium bulbigenum Cooke & Mass., L. E. Hawker and B. Singh (*Brit. Mycol. Soc. Trans., 26 (1943), pt. 3–4, pp. 116–126*).—The disease symptoms and morphology of the fungus are described in detail. Inoculations showed that the pathogen can enter unwounded roots of *Lilium regale* and of seedling lilies but cannot penetrate unwounded bulb scales. A strain from narcissus caused rotting of wounded bulb scales more slowly than the lily strain. A high incidence of both pre- and post-emergence damping-off of lily seedlings occurred in autoclaved soil contaminated by soil from the vicinity of diseased seedlings or by sand and cornmeal cultures of the fungus. The narcissus strain caused less heavy losses. Old cultures of the lily strain were less virulent than fresh ones. Watering the seed boxes with a suspension of the fungus caused losses. Addition of a formalin dust to the seed boxes before sowing gave good control, and watering the soil in frames with a liquid formalin before planting or watering growing seedlings with a weak solution of Uspulun also gives some protection.

Notes on basal rot of narcissus, I, II, L. E. Hawker (*Ann. Appl. Biol., 30 (1943), No. 4, pp. 323–326*).—The following are included:

I. *A comparison of various methods of using formalin in connection with the hot-water treatment against eelworm* (pp. 323–324).—Control of basal rot (*Fusarium bulbigenum*) following hot-water treatment against nematodes was equally good when 0.5 percent of formalin was included in the bath or was used as a cold or warm steep immediately afterward; when the formalin steep was delayed, control was less effective. All methods of applying formalin used in this study in connection with hot-water treatments were equally harmless to growth and flowering of the bulbs.

II. *Infection of bulbs through dying roots in summer* (pp. 325–326).—Inoculations in situ of narcissus roots with *F. bulbigenum* cultures in early summer were successful, as shown by the presence of rotted bulbs either at time of lifting or in storage, but only when the soil was wet at and after the time of inoculation. Cool weather delayed infection. Bulbs planted during the fall in soil artificially or spontaneously contaminated with the fungus gave a complete stand in spring but later showed considerable losses from basal rot.

Über den Rost von Vinca herbacea [Rust of V. herbacea], G. Karel (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 450–454, illus. 5*).—On a rust of herbaceous periwinkle, due to a form of *Puccinia vincae.*

Über Puccinia anatolica n. spec. auf Vinca herbacea W. et K. [P. anatolica n. sp. on V. herbacea], G. Gassner (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 455–474, illus. 13*).—On a new rust infecting herbaceous periwinkle.

Die Bedeutung der Winterkälte für die Kernbildung der Buche [The significance of winter cold in heartwood formation in beech], P. Larsen (*Schweiz. Ztschr. Forstw., 94 (1943), No. 9, pp. 265–273, illus. 9*).—Concerns redheart and frostheart.

Studies in the genus Ustulina, with special reference to parasitism.—VI, A brief account of heart rot of beech (Fagus sylvatica L.) caused by Ustulina, W. H. Wilkins (*Brit. Mycol. Soc. Trans., 26 (1943), pt. 3–4, pp. 169–170, illus. 4*).—The symptoms of decay in a 170-year-old tree are described.

Untersuchungen über Massaria macrospora (Desm.) Sacc., ihre Nebenfruchtform Coryneum macrosporum Berk. und Asterosporium hoffmanni Kze. [Investigations of M. macrospora, its imperfect stage C. macrosporum or A. hoffmanni], H. Fischer (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 512–517, illus. 8*).—According to the studies reported, it is concluded that this fungus, weakly pathogenic on European beech, belongs to the Pseudosphaerales rather than to the Sphaerales. Neither on dead twigs or lesions on European beech and hornbean trees nor in agar cultures arising from ascospores of *M. macrospora* or conidia of *C. macrosporum* were pycnidia or pycniospores of *Diplodia faginea* detected. These and other experiments described throw doubt on either *D. faginea* or *A. hoffmanni* as being connected with *M. macrospora.*

White pine blister rust control—Michigan—Annual Report, 1943, J. K. Kroeber ([*Lansing*]: *Mich. Dept. Agr., 1943, pp. 16+, illus. 3*).—See previous reports (E. S. R., 89, p. 235).

Root and butt rot in planted white pine at Biltmore, North Carolina, G. H. Hepting and A. A. Downs. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 2, pp. 119–123, illus. 1*).—About 75 percent of the trees in previously thinned white pine plats were affected by root and butt rots; a smaller percentage of those in the isolation strips around these plats were also rotted, as well as 4 percent of the trees in previously unthinned plats which were butt-rotted. These decays were caused mostly by *Fomes annosus*, with a small percentage of *Polyporus circinatus* and *P. schweinitzii.* Entry points for the fungi were provided through roots that had died as a result of strangling or other causes, apparently associated with a poor arrangement of the roots traceable to poor planting. The larger amount of butt rot in thinned stands may be due to a build-up of *F. annosus* in the stumps of previous thinnings.

Methods for obtaining fructifications of wood-rotting fungi in culture, E. C. Badcock (*Brit. Mycol. Soc. Trans., 26 (1943), pt. 3–4, pp. 127–132, illus. 6*).—Methods are described for culturing wood-rotting fungi on a medium consisting of sawdust to which various nutrients are added, so as to produce in fairly short periods fructifications which are sufficiently typical of the species to be readily recognized. The conditions most favorable for sporophore production are briefly discussed; they include provision of a rich medium con-

taining readily available food materials in addition to wood substance, plentiful moisture in the substratum, an atmosphere not saturated but with a fairly high relative humidity around the fruiting bodies, and exposure to daylight of moderate intensity.

The stem and bulb eelworm, Anguillulina dipsaci (Kühn, 1858): The importance of collating evidence on the behaviour of biologic strains, G. Fox Wilson (*Ann. Appl. Biol., 30 (1943), No. 4, pp. 364–370, illus. 5*).—The technic and results of experiments on the infestation of many different host plants with seven biological strains of the stem and bulb nematode of known history are given, along with findings by others. The biologic strain theory in relation to *A. dipsaci* and the merits of the trinomial system of nomenclature in connection with unspecialized races are discussed. The factors concerned with nematode outbreaks are also considered, and the relationship existing between flower color in herbaceous phloxes and the degree of infestation by *A. dipsaci* is presented. There are 49 references.

Soil fumigant effective against nematodes, J. A. Pinckard. (Miss. Expt. Sta.). (*Food Packer, 25 (1944), No. 1, pp. 43–44, illus. 3*).—In the preliminary experiments reported, ⅛ oz. of liquid D–D mixture (dichloropropylene-dichloropropane) was poured in the bottom of 6-in. holes in the ground spaced about 18 in. apart in staggered rows, and 3 weeks later squash was planted between the treated rows. Results in controlling root knot were so gratifying and the method so simple and economical to use that it is suggested growers experiment with the mixture on crops of their own choice in infested soils.

ECONOMIC ZOOLOGY—ENTOMOLOGY

General notes (*Jour. Mammal., 25 (1944), No. 1, pp. 84–92, illus. 3*).—The following are included: A Criticism of Marshall's Method for Censusing Mink, by J. A. Sealander (pp. 84–86); A Comparison of Overwintering Populations of Small Mammals in a Northern Coniferous Forest for Two Consecutive Years, by D. C. Quimby (pp. 86–87) (Univ. Minn.); Abundance of House Mice at Davis, California, in 1941–42, by F. C. Evans and T. I. Storer (pp. 89–90) (Univ. Calif.); Mating of Muskrats (p. 90) and Red Fox's Method of Hunting Field Mice (pp 90–91), both by W. P. Smith; A Red-Grey Fox Hybrid, by H. Bezdek (p. 90); Attainment of Sexual Maturity in Raccoons, by C. H. Pope (p. 91); and Additional Records of the Merriam Shrew in Montana, by. E. T. Hooper (p. 92).

Food requirements of some Alaskan game mammals, L. J. Palmer (*Jour. Mammal., 25 (1944), No. 1, pp. 49–54*).—Determination of range grazing capacity for game is essential in wildlife management and is receiving increasing attention. This contribution presents the results of feeding tests with musk ox, reindeer, and caribou, suggests the food requirements for Alaska game animals, discusses lichens as feed, gives figures on the game animal density in Alaska, and summarizes the principal forage eaten by caribou, Sitka deer, moose, musk ox, Dall sheep, and buffalo.

Distribution and status of pronghorn antelope in Montana, J. Beer (*Jour. Mammal., 25 (1944), No. 1, pp. 43–46, illus. 1*).—The pronghorn antelope is still found over much of its original range in the State. Though its numbers will never approach the 2,500,000 head formerly roaming the prairies, they are said to be increasing to a point where they may soon be numerous enough for an open season. It is estimated that at present there are about 14,233 head in Montana.

The status of the wolf in Michigan, A. M. Stebler (*Jour. Mammal., 25 (1944), No. 1, pp. 37–43, illus. 2*).—The wolf (*Canis lycaon*) apparently once ranged throughout what is now known as Michigan, but recent occurrence records

from bounty disbursements indicate that it is now practically if not entirely restricted to the Upper Peninsula. This carnivore seems definitely to prefer conditions of relative wilderness, and the modification of the primitive habitat by man may have had more effect in reducing its range and numbers in the State than all control measures hitherto attempted. According to stomach and scat analyses of the meager material collected over a few months, deer and snowshoe hares are equally important in the diet of the wolf; field observations, however, indicate that deer form the mainstay in winter. Though traditionally the wolf is supposed to be an extravagant predator, autopsies of 238 deer carcasses found mostly in winter and early spring appeared to show that death in only 13 percent had been due to predation, against 72 percent by malnutrition, disease, and accidents and 15 percent by unknown causes. If the summer toll of deer along the highways had been included in these data, doubtless predation would have become even more minor as a factor in their mortality. With the number and size of wilderness districts tending to diminish with the passage of time, the wolf is in real danger of becoming entirely extirpated in Michigan.

Food habits of red foxes of the Maryland marshes, W. S. Heit. (Cornell Univ.). (*Jour. Mammal., 25 (1944), No. 1, pp. 55–58*).—This preliminary study concerned the status of the red fox (*Vulpes fulva*) in the muskrat marshes of Dorchester County on the Eastern Shore of Maryland. Among the total of 95 scats collected (Mar.–Apr.) the following percentages of occurrence were found: Field mice proved to be the most important food item, but muskrats were found in 38.9 percent, indicating a far larger depredation than suspected and one of importance to trappers in this and probably in similar nearby areas. Birds were also an important item on the menu (18.9 percent) and occurred with astonishing regularity; undetermined mammal remains were found in 13.6 percent of the scats and insects in 9.4 percent; and seeds, mainly dewberry and persimmon, occurred in 10.5 percent.

The ecological relationships of red fox food in eastern New York, D. B. Cook and W. J. Hamilton, Jr. (Cornell Univ.). (*Ecology, 25 (1944), No. 1, pp. 91–104, illus. 5*).—A 6-yr. study indicated the principal food items to be cottontail rabbits, apples, meadow mice, wild fruits, and insects. In winter the diet was chiefly mammals; from the time of the first strawberries until fallen apples were covered with snow, fruit was more important than flesh; insects were taken to a limited extent in summer and fall; birds were of little importance at any season. The bulk of the food was produced by brush lots, fence rows, and grassland; products of the forest were of minor importance.

Some food coactions of the northern plains red fox, T. G. Scott. (Iowa Expt. Sta. et al.). (*Ecol. Monog., 13 (1943), No. 4, pp. 427–479, illus. 32*).—In this study the home range, movements, and life history of red foxes in the Des Moines River Valley, Iowa, were found importantly related to the food interrelationships because the animals naturally fed within the limits of their living space. Through investigation of feeding tendencies by analysis of fecal passages, red foxes were found to be primarily carnivorous but consuming substantial quantities of insect and plant foods when available. Warm-blooded vertebrates were less frequent in the warm than in the cold weather diets, whereas the reverse was true for insects and plants. The principal staples were cottontails and mice; preference for the meadow mouse was high, insectivores and weasels were regularly left uneaten, and carrion advanced in decay did not appear attractive as food. In April, when the pups depended most on the adults for food, the remains of warm-blooded vertebrates were more frequent in the fecal remains from the dens than from the trails, and limited occurrences of

invertebrate and plant materials were detected in passages from the trails but not from the dens. In May, when the pups presumably depended less on the adults, the reverse was true. Within the limits of its fundamentally carnivorous nature, the red fox was mainly influenced by availability of foods. So far as could be determined, foxes failed to exert a dominant influence on populations of the prey animals regularly consumed, for the direction of seasonal and annual population trends seemed to continue unchanged by pressure of fox predation.

The snowshoe hare—a serious enemy of forest plantations, C. M. and S. E. Aldous (*Jour. Forestry, 42 (1944), No. 2, pp. 88–94, illus. 3*).—Snowshoe hares nip off the terminal and lateral buds of coniferous seedlings, thus tending to deform the trees as well as retard their growth. The success of many plantings depends on the protection of young seedlings during the time of high population peaks, which occur approximately in 10-yr. cycles. Though not highly effective, the following control measures against hares are of value: During periods of high population, plantings should be confined to open sites of several acres or more. Areas in low brush cover or adjacent to swamps should be planted only during the low part of the hare cycle to large thrifty stock, followed by release cuttings where necessary. Repellent sprays applied in the nursery prior to field planting will delay hare injuries, and field treatments on a limited scale may aid in bringing the trees through a critical period. Hunting and snaring on limited areas effectively reduces damage, and poisoning can be used successfully in a selective manner where prejudice does not prevent its use. Supplemental feeding by felling aspen in coniferous plantations during years of peak population will tend to attract the animals from planted seedlings.

Ecologic niches occupied by rabbits in eastern Texas, W. P. Taylor and D. W. Lay (*Ecology, 25 (1944), No. 1, pp. 120–121*).—A brief note on the distribution and habitats of the Oklahoma cottontail, Merriam jack, and Alabama swamp rabbits in this area.

Notes on growth, sex and age ratios, and suggested management of Minnesota muskrats, L. J. McCann (*Jour. Mammal., 25 (1944), No. 1, pp. 59–63*).—The sex ratio between fall and spring was found to be approximately 1 female to 1.2 males; a differential spring and summer mortality reduced the number of adult males and reversed the ratio by fall to 1.2 adult females to 1 adult male. Since the muskrat is loosely monogamous, a decrease in males should result in a commensurate number of barren females. It would thus be unwise to set trapping regulations in such a manner that a differential take of males would occur. A majority of males in the young of the year compensates for the natural losses among adult males in spring and summer. The breeding season in Minnesota begins in late March; the female averages two litters a year of about six individuals each, but juvenile mortality reduces the number by the trapping season to six young per breeding female. The size and quantity of muskrats varies with the conditions under which they develop. Juvenile muskrats increase in size during the winter months. A reduction by trapping in December of not more than 50 percent of the total population is said to be close to the safe limit for maintaining the population over a period of years.

Observations on the ecology of the Gunnison prairie dog in Colorado, W. Longhurst. (Cornell Univ.). (*Jour. Mammal., 25 (1944), No. 1, pp. 24–36, illus. 6*).—Tongues of the *Artemisia-Chrysothamnus* plant association characteristic of the valley floor have extended up the stream valleys to 9,000 ft. or more; it is along these tongues of Upper Sonoran vegetation that prairie dogs have extended their range upward to the mountain meadows that would otherwise be largely cut off from them by belts of timber, which are unfavorable as habitats. In this study the Gunnison prairie dog (*Cynomys gunnisoni gunnisoni*) was

selected for observation relative to its general habits, burrowing activities, sanitation, reproduction, growth, food habits, enemies, parasites and enemies, and economic importance, each of which is discussed in some detail. Since over 80 percent by frequency of occurrence of their food was composed of grass species useful to cattle and sheep and only about 16 percent of undesirable pest plants of the range, it is concluded that prairie dogs definitely conflict with the best interests of livestock and to some extent with those of cultivated crops. It was also apparent that the valley clearing of the land for agriculture had favored the increase of these rodents; extreme concentrations ran as high as 30 per acre. Burrows are frequently injurious to stock, particularly horses, which step into them while running. Buteo hawks, coyotes, and badgers were found to be the principal enemies of prairie dogs in this area during summer; the only ectoparasites found were fleas of the genus *Opisocrostis*. In spite of the fact that the prairie dog is one of the most characteristic and interesting animals of the West, it seems evident that on most parts of its range it should be rigidly controlled, not necessarily to extinction, but to the point at which it will no longer be detrimental to the agricultural and livestock industries.

The Richardson ground squirrel Citellus richardsonii Sabine in southern Alberta, its importance and control, J. H. Brown and G. D. Roy (*Sci. Agr., 24 (1943), No. 4, pp. 176–197, illus. 5*).—This native of southern Alberta is a prairie-inhabiting rodent that feeds on roots and seeds, lives in a burrow, and spends the winter in hibernation. Only one litter of 4–9 young is born in a year. Until 1938 it was looked upon as an agricultural pest only, doing great damage to field and garden crops, but in 1939 it was discovered to be also a menace to human health as a reservoir of sylvatic plague spread by its fleas and as a host for certain stages of the tick vector of Rocky Mountain spotted fever. Later (1942) it was discovered to be also a carrier of tularemia. Prior to 1940 a large sum of public money was spent annually on poison and in bounties to control this pest, but in 1940 the bounty was removed to protect children from the danger of infection; little has since been spent for control—a mistake that should be remedied by an immediate well-organized campaign. Methods of control should depend on the density of population and on whether the area is or is not plague-infected. Strychnine baits have been used with great success, but there are said to be strong indications that a bait made of sodium arsenite and oats may be cheaper and equally effective.

An ecological study of tree squirrels in eastern Texas, R. H. Baker (*Jour. Mammal., 25 (1944), No. 1, pp. 8–24, illus. 5*).—An account is presented of gray and red squirrel populations as observed during time-area counts at study plats in Polk and Tyler Counties (Aug. 1940–Aug. 1942) in an attempt to explain the fluctuations in visible densities. Squirrels were considerably more abundant on mixed bottom and hammock than on pure hammock plant associations, apparently because of a more favorable food supply in the former. It is concluded that their activity depends in part on the available food supply, especially the fall acorn crop, and is sensitive to any change therein. Squirrels were more active early in the day, especially during spring and summer when the morning warmed up more rapidly. Gray squirrels outnumbered fox squirrels in the mixed bottom and hammock, whereas a more even ratio was evident in the pure hammock. The number of leaf and twig nests was at least partly correlated with the type of habitat and with the number of available hollow den trees; the indications were that a larger number of nests were utilized in summer than in winter. There was a definite correlation between weights and total length measurements in gray squirrels. A detailed account is given of the breeding activities of a group of eight gray squirrels. Two species of ticks and one each

of fleas and lice, as well as two cestode and four nematode species, were found as parasites of both red and gray squirrels. Regulating the kill proved to be the most practical method for increasing squirrel populations in Texas; overhunting, together with depletion of the habitats by excessive logging and overgrazing, have contributed to the decline of squirrels in this region.

Damage to conifers in northern Idaho by the Richardson red squirrel, C. R. Stillinger. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 2, pp. 143–145*).—Barking and girdling of young conifers were observed in this area in 1942. *Larix occidentalis* and *Pinus contorta* were most severely attacked, with occasional damage to *P. monticola, P. ponderosa, Abies grandis,* and *Pseudotsuga taxifolia.* That the damage might prove serious locally is indicated by the fact that on an 0.8-acre plat with 35 scattered trees 73 percent of the lodgepole pine and 21 percent of the larch were completely girdled and 13 and 26 percent, respectively, had been partially girdled.

Water soils in relation to lake productivity, E. W. Roelofs (*Michigan Sta. Tech. Bul. 190 (1944), pp. 31, illus. 18*).—Though biologists, generally, do not recognize an index to lake productivity from the standpoint of fish production and the fisheries biologist, it is believed that with certain exceptions plant abundance and distribution may so serve. Factors governing plant growth and distribution then become the greatest influences on lake productivity. The most important factors in plant distribution are those associated with the location, position, size, and shape of the lake basin. Location influences productivity through the nature of the watershed and the lake's relation to hills or forests. Position determines the relative portion of the lake which will be subjected to wind and wave action. Smaller lakes are generally more productive per unit of area than larger lakes. Shape of basin determines the relative amount of shallow water and the degree of slope of the bottom in the plant zone—both important factors in plant distribution. These physical factors also greatly influence the distribution of the bottom deposits; the effect of bottom deposits on plant distribution therefore becomes an indirect function of the physical factors. Nutrient and organic matter contents of the bottom play prominent roles in plant distribution, their effects being most noticeable and best demonstrated when the amounts are low. Organic matter seems particularly important to plant distribution in marl lakes. This relationship is believed to exist because of the influence of organic matter on the chemical equilibrium between Ca and the nutrients P and Fe, as well as through the liberation of CO_2. The most productive bottom types are those consisting of mixed mineral and organic materials. Reasons for this are adequate available nutrients and CO_2 production, a consistency favoring root development, and a general occurrence in locations and under conditions otherwise favorable to plant growth. Small-scale experiments indicated that fertilization of lakes, using both commercial fertilizers and natural fertilizing materials, has a place in the fisheries management of inland lakes.

Applied entomological taxonomy, H. H. Keifer (*Pan-Pacific Ent., 20 (1944), No. 1, pp. 1–6*).—For purposes of this address, applied taxonomy is defined "as that portion of arthropod classification dealing with the specific identification in and the bionomical coordination of, arthropod groups containing species in competition with or dangerous to the human animal; or in groups which contain species that help control effectively the harmful kinds." The practical value, present status, and future of arthropod taxonomy thus defined is discussed in relation to economic operations.

Lista de algunos nombres vulgares de insectos [List of some common names of insects], G. Brücher E. (*Bol. Sanid. Veg. [Chile], 2 (1942), No. 2, pp.*

120–125).—Nearly 100 species of Chilean crop pests are listed by Latin name, followed by order and family and Spanish common name.

Entomologia agricola: Identificacion y control de insectos y otros animales dañinos o utiles a las plantas [Agricultural entomology: Identification and control of insects and other animals injurious or useful to plants], O. Chiesa Molinari (*San Juan, Argentina: D'Accurzio Impresor, 1942, pp. 571+, illus. 510*).—The three parts of this work deal, respectively, with general entomology, a systematic exposition of the insects of Cuyo (western Argentina) injurious to plants, and other animals injurious to plants. Numerous keys for identifying the various insect groups from orders down to species are included. A copious bibliography and indexes to host plants and to species and groups of insects conclude the volume. Two introductory statements are by J. Liebermann and L. H. Bertolini, respectively.

Una sencilla innovacion en las preparaciones microscopicas de insectos pequeños [A simple innovation in microscope preparations of minute insects], H. Pairoa E. (*Bol. Sanid. Veg. [Chile], 2 (1942), No. 2, pp. 126–131, illus. 3*).—A technic for preparing microscope slides is described and illustrated.

[Studies of insect pests in Maine] (*Maine Sta. Bul. 420 (1943), pp. 537–538, 539–543, 544–546, 555–557, 560–561, illus. 2*).—These studies included the European corn borer; Mexican bean beetle; bean weevil; rotenone for pea aphid control; apple mealybug; emergence and control of apple fruit fly; and control of plum curculio, gypsy moth, European red mite, and blueberry fruit fly.

Principales plagas agricolas producidas por insectos y otros animales que fuer on objeto de consulta en el segundo semestre (Julio–Diciembre) de 1942 [Principal insect and other animal pests which were the object of consultation during July–December, 1942] (*Bol. Sanid. Veg. [Chile], 2 (1942), No. 2, pp. 158–162*).—The tabulation includes the Latin and common names of pest and host plant, developmental stage of pest, date, and Chilean locality.

Lista definitiva de los acridoideos de Chile (Orthoptera, Acridodea, Acridoidea), J. Liebermann (*Bol. Sanid. Veg. [Chile], 2 (1942), No. 2, pp. 133–139*).—An annotated list, arranged by families.

Colour variation in British Acrididae (Orthopt.), E. J. Clark (*Ent. Mo. Mag., 4. ser., 4 (1943), No. 40, pp. 91–96, illus. 3*).—A graphic method is here developed for describing the color forms of the locusts and applied to record the forms found among the British Acrididae.

Campaña de erradicacion de la mosca de la fruta en la ciudad de Arica y Valles de Azapa, Codpa y Timar [Campaign for the eradication of the fruitfly in the city of Arica and the Valleys of Azapa, Codpa, and Timar, Chile] (*Bol. Sanid. Veg. [Chile], 2 (1942), No. 2, pp. 175–180*).

Advance of the Japanese beetle, G. T. French (*Va. Fruit, 32 (1944), No. 1, pp. 22–26*).—A brief discussion of the spread of this pest from its arrival in New Jersey prior to 1916 and of control methods, with special reference to Virginia.

Vermischte Studien über Rüsselkäfer, hauptsächlich aus der Sammlung Hartmann, jetzt im Staatl. Museum für Tierkunde, Dresden [Miscellaneous studies of the weevils, principally from the Hartmann collection now in the National Museum of Zoology, Dresden], K. Günther (*Deut. Ent. Ztschr. "Iris," Ergänzungsband, 1943, pp. 10–96, illus. 30*).—Much new nomenclature is included in this taxonomic study.

Ants of the genus Cardiocondyla Emery in the United States, M. R. Smith. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 2, pp. 30–41, illus. 4*).—In this paper the author attempts to present all facts known to him concerning

the taxonomy, biology, and distribution of the four species of *Cardiocondyla* recorded from the United States, including a key. Although thus far they have been found only in Florida, it is reasonable to expect that representatives will eventually be found elsewhere, since their habit of nesting within plants or other exportable material affords them excellent means for wide dissemination by commerce.

Control of the Texas leaf-cutting ant with methyl bromide, H. R. JOHNSTON. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 2, pp. 130–132, illus. 1*).—Methyl bromide is reported effective and practical for controlling this serious pest (*Atta texana* Buckley) on reforestation projects in Texas and Louisiana. Though dangerous if inhaled, it is not inflammable or explosive and is cheaper and easier to apply than the formerly used fumgiant carbon disulfide.

Notes on the habits of Monobia quadridens (Linn.), S. W. FROST. (Pa. Expt. Sta.). (*Ent. News, 55 (1944), No. 1, pp. 10–14, illus. 5*).—Notes are presented on the nest-building and egg-laying habits of this common wasp of the eastern United States. In every case the egg was laid before larvae of the grape leaf folder, used exclusively as provision, were brought in. The wasps apparently hibernate as adults in Pennsylvania.

Further tests on plant products for insecticidal properties, A. HARTZELL (*Contrib. Boyce Thompson Inst., 13 (1944), No. 5, pp. 243–252, illus. 1*).—In continuation of studies previously reported (E. S. R., 87, p. 87), among plant products, upward to 125 species and varieties of plants, and 3 isolated toxins derived from plants tested for insecticidal properties, the acetone extracts of 11 species and varieties gave median lethal dose values (LD 50s) at 24 and 520 p. p. m. to larvae of the southern house mosquito, but water extracts of none of them gave kills within this dose range. The median lethal dose expressed in parts per million for mosquito larvae of acetone extracts of the 11 most promising insecticides tested, as compared with an LD 50 of 0.06 for the isolated toxin rotenone, were for cubeb berries 24, black pepper 29, *Koelreuteria paniculata* seeds and leaves 245, elder flowers 300, jalap root 380, *Papaver* flowers and stems 440; and seeds of Golden Summer Crookneck squash 450, Connecticut Straight-neck squash 460, anise 470, Henderson cucumber 520, and honeydew melon 520. Acetone extracts of black pepper, prickly ash bark, and watermelon seeds at concentrations of about 4,000 p. p. m. failed to give satisfactory kills of the bean aphid. Negative results were also obtained with an acetone extract of black pepper (1.2 percent) emulsified with Penetrol (0.5 percent) in water when tested as a stomach poison on the Mexican bean beetle, but satisfactory kills were obtained when bean plants were dusted with black pepper and adults allowed to feed on the foliage under experimental greenhouse conditions.

El barbasco (derris), A. F. SIEVERS. (U. S. D. A.). (*Rev. Inst. Defensa Café Costa Rica, 13 (1943), No. 107–108, pp. 621–632*).—A general discussion of derris species and varieties, the regions in which it may be cultivated, rotenone and total extractive content of the roots, propagation and cultivation, drying and preparation for market, marketing, cost of production and profits, diseases and insect pests, and production, consumption, and exportation. Statistics on the exportation of derris root from the East Indies, English Malaya, and the Philippines for 1934–38 are appended.

Histological effects of piperine on the central nervous system of the housefly, A. HARTZELL and M. STRONG (*Contrib. Boyce Thompson Inst., 13 (1944), No. 5, pp. 253–257, illus. 2*).—Piperine had distinct and characteristic effects on the central nervous system and associated muscles of the housefly, as shown by a preliminary histological study. The foremost result was the destruction of the fiber tracts and vacuolization of the brain nerve tissue, but the widespread clump-

ing effect of the chromatin of the nuclei characteristic for pyrethrum was not observed here.

First annual report on the operation of the Texas Insecticide and Fungicide Law, J. E. McDonald and G. S. Fraps (*Texas Sta. Cir. 104 (1944), pp. 12*).—A discussion of the work for the period May 2 to August 31, 1943, including analyses of arsenicals, sulfur (alone and in mixtures), and miscellaneous insecticides and fungicides.

The effect of boll weevil infestation at different levels on cotton yield, A. L. Hamner (*Mississippi Sta. Bul. 389 (1943), pp. 11, illus. 4*).—Previously noted from another source (E. S. R., 89, p. 717).

Un "gorgojo acuático del arroz" Argentino, "Lissorhoptrus bosqi" n. sp. (Col.: Curculionidae) [An aquatic weevil of Argentine rice, L. bosqi n. sp.], G. Kuschel (*Inst. Mus. Univ. Nac. La Plata, Notas, 8 (1943), Zool. No. 71, pp. 305–315+, illus. 5*).—A description of the new species, with notes on its biology.

A summary of insecticide tests on the sugarcane borer in 1941, A. L. Dugas and J. W. Ingram. (La. Expt. Sta. and U. S. D. A.). (*Sugar Bul., 22 (1944), No. 10, pp. 73, 74–77*).—Straight synthetic cryolite and also an 80 percent mixture of both synthetic and natural cryolite with inert carriers at about 10 lb. per acre were tested against first-generation borers at two locations, four applications of dust being made at 5-day and weekly intervals beginning April 22 and 24, respectively. Straight cryolite was slightly more effective (97 and 98 percent reduction in damage, respectively) than the mixtures, but all treatments gave a high degree of control. In another test in three locations the control at harvest was considerably less, indicating a heavy reinfestation by borers from adjacent fields. In two small-plat tests against second-generation borers four weekly applications of straight synthetic cryolite and 80 percent mixtures of synthetic and natural cryolite with inert carriers were made between June 24 and 25, respectively, at the rate of about 10 lb. per acre. All gave significant control of second-generation borers, with very little difference among the treatments. The straight synthetic cryolite reduced the number of bored stalks by about 55 percent. In three large-acreage plats with two, three, and four weekly applications of this cryolite the last week of June at about 12 lb. per acre on the first two and 9 lb. on the third plat, the reduction was about 36 and 39 percent in the first two and 48 percent in the third plat. In another experiment four weekly applications of cryolite, lead arsenate, sulfur, lime, and 7 percent copper derived from tribasic copper sulfate were made at the rate of 10 lb. per acre. Both cryolite and lead arsenate gave significant borer control and neither injured *Trichogramma*. Sulfur gave a substantial increase in borer infestation associated with a significant reduction in natural parasitization of borer eggs by *Trichogramma*. Cryolite gave an increased yield of 4.84 tons of cane per acre and lead arsenate accounted for an increase of 2.66 tons; sulfur actually decreased the yield by 1.94 tons per acre. In first growth of summer-planted cane, straight synthetic cryolite, 80 percent mixtures of cryolite with pyrophyllite, and a spray consisting of 6 lb. synthetic cryolite, 8 oz. spreading agent, and 150 gal. water all gave significant borer control. Straight synthetic cryolite dust was slightly better than the spray, which was in turn a little more effective than the mixtures. In a second small-plat test of summer-planted cane both sulfur and lime caused a 35.1-percent increase in numbers of dead hearts, whereas straight synthetic cryolite reduced the number of dead hearts about 96 percent. A lower natural parasitization by *Trichogramma* followed treatments by both sulfur and lime.

Spray and dust controls for lima bean pests, H. C. Huckett. (N. Y. State Expt. Sta.). (*Food Packer, 25 (1944), No. 1, pp. 44–45*).—In order to combat

such pests as the Mexican bean beetle or red spider mite on lima beans in a climate such as that of Long Island (N. Y.) it is recommended that sprays or dusts be applied containing a rotenone-bearing powder such as derris, cube, or timbo. Detailed formulas and schedules are presented for inclusion with fungicides or other insecticides.

Campaña contra el bruco del frejol en el Valle de Limache [Campaign against the bean weevil in the Valley of Limache, Chile] (*Bol. Sanid. Veg. [Chile], 2 (1942), No. 2, pp. 181–183*).

Further investigations on the biology and control of the carrot fly (Psila rosae F.), F. R. Petherbridge and D. W. Wright (*Ann. Appl. Biol., 30 (1943), No. 4, pp. 348–358, illus. 3*).—In continuation (E. S. R., 89, p. 574), it was found from emergence records for the first and second generation of the carrot rust fly at two locations in England that there is a correlation between the age of the carrot crop and the commencement of emergence of the second generation therefrom. The first generation was successfully controlled by killing the flies with a poison bait sprayed on the dike sides of the carrot fields, this method also reducing the population of and attack by the second generation. Spraying the dike sides and/or the headlands of eight main-crop carrot fields in August–September greatly reduced the second generation damage. Very high kills were obtained on headlands of treated fields, but poor results were obtained on three very weedy fields which were incompletely treated. A marked increase in attack occurred in three untreated areas in 1942 as compared with the preceding year. Application of poison bait spray in the field is discussed. Creosote-treated string gave promising results in small-scale tests against the second generation, but calomel dust (4 percent) with or without grass cuttings caused no reduction in attack. In hot sunny weather the flies shelter in the vegetation around carrot fields from about 10 a. m. until 5 p. m. In the cooler early morning and evening there is a movement of flies into the field; this rhythm is not maintained in dull warm weather. Seedling carrots may be attacked in the field any time after the cotyledon stage, thus enabling the first generation flies to propagate on main carrot crops. Soil sections about carrot rows indicated that pupae of the overwintering generation are closely congregated around the roots. Various insecticides were tested against the pupae in the soil, a creosote-sawdust mixture giving best results. Storage tests showed that clamped carrots deteriorate much less than those left unlifted. The population of flies is greatly increased by allowing attacked carrots to remain unlifted throughout the winter or by plowing in.

Acrolepia assectella Zell. (Lep.: Plutellidae) in England, S. G. Jary and H. M. Edelsten (*Ent. Mo. Mag., 4. ser., 5 (1944), No. 49, pp. 14–15*).—Serious damage to leeks by this insect is reported; it is presumed to have been introduced from the European Continent, where it is a serious pest.

The codling moth problem, W. S. Hough. (Va. Expt. Sta.). (*Mountaineer Grower, 15 (1944), No. 151, pp. 8–10*).—A brief history is presented of codling moth control in commercial apple growing districts of Virginia during the past 25 yr. Included is a table indicating the relative ability of the larvae to enter sprayed apples and the average percentage of live entries found in the sprayed fruits.

Codling moth situation in 1943 in the vicinity of Roanoke, J. A. Cox. (Va. Expt. Sta.). (*Va. Fruit, 32 (1944), No. 1, pp. 53–57*).—Severe damage in a number of commercial orchards is reported; the continuous emergence of the moths made timing of the sprays difficult, especially where nicotine sulfate was used with lead arsenate. A large carry-over of wintering larvae and a small apple crop increased the percentage of injured fruit in some orchards. The season's weather seemed favorable to codling moth development. Seasonal data are tabulated and discussed.

Controlling severe codling moth infestations, W. S. Hough. (Va. Expt. Sta.). (*Va. Fruit, 32 (1944), No. 1, pp. 57–63*).—A general discussion of the factors influencing severe infestations and of insecticidal control (stickers, lead arsenate dosage, and egg- and moth-killing sprays), with a spray program for Virginia conditions.

Injury to citrus by Tenuipalpus mites, H. C. Lewis (*Calif. Citrog., 29 (1944), No. 4, p. 87, illus. 1*).—On the evidence presented, mites of this group on citrus appear to be either native or long established in California, but they have rarely developed to damaging numbers and are usually controlled by the ordinary treatments for scale and thrips. A case of considerable damage over the past 2 yr. in a grove of Lisbon lemons by a species resembling *T. bioculatus* is reported.

Apple spraying for 1944, E. C. Sherwood. (W. Va. Univ.). (*Mountaineer Grower, 15 (1944), No. 151, pp. 3–5, 7–8*).—The author discusses a threefold spray program for apples recommended for West Virginia conditions, viz, the sprays for controlling scale insects, rosy aphid, and red mite; those usually of critical importance for scab control; and the summer cover sprays designed primarily for controlling codling moth.

Apple maggot control in Minnesota, A. C. Hodson (*Minn. Farm and Home Sci.* [*Minnesota Sta.*], *1 (1943), No. 1, pp. 11–12, illus. 5*).—A practical account.

Household pests, J. T. Creighton (*Fla. Univ. Agr. Ext. Bul. 122 (1943), pp. 55, illus. 29*).—"Scientific workers have devised effective means for the control or eradication of all household pests. This information should constitute an important addition to the library of every modern home." The present bulletin attempts to fill this need.

Observations on species of Lepidoptera infesting stored products.—XII, Tinaea secalella Zacher ("the rye moth"), a synonym of Tinaea infimella Herrich-Schäffer (Tinaeidae), A. S. Corbet (*Entomologist, 76 (1943), No. 967, pp. 252–253*).—Brief notes from the literature, with the statement that "in view of the observations of the continental authors, this species must be regarded as a potential pest of stored rye."

Changes in weight and water content during the life cycle of the wood-eating beetle Passalus cornutus Fabricius, I. E. Gray (*Biol. Bul., 86 (1944), No, 1, pp. 23–30, illus. 4*).—In the egg little change occurred for the first 5 days of development; then the egg weight and volume and the amount of water increased steadily until hatching. Increase in weight was due to water uptake; as weight, volume, and water content increased, the egg color changed from bright red to dark green. During larval life (about 2 mo. in the laboratory at 27° C.) the weight may increase more than 10,000 percent. A slight fall in weight occurred when the larva ceased to feed and entered the prepupal stage. On emergence of the adult there was a sharp drop in weight amounting to about one-sixth the maximum larval weight. The water content of a newly laid egg was about 68 percent, which increased to 83 percent at time of hatching. Newly hatched larvae contained about 85 percent water, which after feeding began increased to about 90 percent. A slight fall in water percentage occurred when the larva ceased to feed, but it again increased in the prepupal and pupal stages until in the late pupa it reached a high of 93 percent. The fall in water content is gradual in newly transformed adults, and several months may be required for it to reach a level of the 67 percent characteristic of old adults. The gradual change in water content of new adults was correlated with the slow increase in dry weight, slow sclerotization of the integument, and with changes in color from red to black.

A new species of Aedes from Florida (Diptera: Culicidae), W. M. Middlekauff (*Ent. Soc. Wash. Proc., 46 (1944), No. 2, pp. 42–44, illus. 1*).—*A.*

(*Ochlerotatus*) *mathesoni* n. sp. is described. This mosquito is at least locally distributed over a wide area of central and southern Florida and appears to be a late summer and fall species.

A new mosquito record from Utah (Diptera: Culicidae), D. M. Rees (*Pan-Pacific Ent., 20 (1944), No. 1, p. 19*).—*Mansonia perturbans* (Walker) is reported as a genus and species new to the State.

Observations on Anopheles annulipes Walk. as a possible vector of malaria.—I, The relative susceptibility of An. annulipes and An. punctulatus var. moluccensis Sw. to experimental infection with malaria parasites, F. H. S. Roberts (*Austral. Jour. Expt. Biol. and Med. Sci., 21 (1943), No. 4, pp. 259–262*).—It is shown that this mosquito is experimentally just as hospitable to *Plasmodium vivax* and *P. falciparum* as is *A. punctulatus moluccensis* Sw. & Sw. de G. However, this does not indicate whether *A. annulipes* may become an important vector in nature.

Laboratory studies on the infectivity of Anopheles annularis, B. C. Basu (*Jour. Malaria Inst. India, 5 (1943), No. 1, pp. 31–51*).—In this study of the influences of various factors on the experimental transmission of *Plasmodium vivax*, *P. falciparum*, and *P. malariae* by *A. annularis*, atmospheric temperature proved highly important but relative humidity less so. At lower temperatures the life of this mosquito was prolonged and also somewhat at higher temperatures when accompanied by high relative humidity. At 100° F. and 50–100 percent relative humidity the mosquito failed to survive long enough to become infective. At 60°–90° and the same humidities, gut and gland infections with *P. vivax* and *P. falciparum* were observed; the infectivity rate increased with rises in temperature but not humidity. At 50° and 50–100 percent r. h. no infection was observed with *P. vivax* and *P. malariae* and only a few with *P. falciparum*. The density of gametocytes in the donor's blood had an important bearing on malaria infection in mosquitos, but the "quality" or maturity of the gametocytes was of equal importance.

On the bionomics of Anopheles culicifacies Giles.—I, Longevity under controlled conditions of temperature and humidity, R. Pal (*Jour. Malaria Inst. India, 5 (1943), No. 1, pp. 77–85, illus. 3*).—In the laboratory, adult females exposed to a constant temperature of 104° F. failed to survive more than 24 hr., irrespective of relative humidity; at 95° and relative humidities of 20–100 percent they lived 4–10 days, but at this temperature low and excessive humidities proved detrimental; at 86° they survived 6–18 days and at 77°, 14–28 days. At all these temperatures the fluctuations in survival periods for the females appeared to depend essentially on the prevailing degree of relative humidity, and the maximum longevity was recorded in combination with a constant relative humidity of 60–80 percent. At very low temperatures (e. g., 65° and 55°) the survival period was 4–8 weeks, increasing progressively with rise in relative humidity. Below the freezing point the insects died within 5 min. The females failed to survive a 5-min. exposure at 122° or 1 hr. at 105.8°; the latter is considered the thermal death point. Field observations on longevity confirmed these findings. *A. culicifacies* overwinters in both larval and adult stages in the Punjab. Temperatures of 77°–86° in combination with 60–80 percent relative humidity appear to represent the most favorable climatic conditions for the species.

The relationship between the breeding places of A. fluviatilis and human dwellings and its significance in limiting the scope of antilarval measures, T. S. Adisubramaniam and J. C. Vedamanikkam (*Jour. Malaria Inst. India, 5 (1943), No. 1, pp. 53–58, illus. 2*).—In this investigation into the relationship between the breeding and feeding grounds carried out in two selected areas in the Madras Presidency the maximum density of larvae was found within 1,000 ft.

of human habitations. A 1,000-ft. section of stream in which the density of larvae was high was controlled and its effect on the adult collections recorded, with the conclusion that antilarval measures against *A[nopheles] fluviatilis* may be limited to breeding places within 1,000–1,500 ft. of human dwellings.

Trimming the edges of breeding places near human habitations as an antilarval measure, A. K. Subbaraman and J. C. Vedamanikkam (*Jour. Malaria Inst. India, 5 (1943), No. 1, pp. 113–115, illus. 1*).—In this preliminary study the method was applied as a control measure against *Anopheles fluviatilis* on a mile length of stream in the Wynaad, South India, with excellent results. The cost compared favorably with that of all other measures undertaken in the area.

Laboratory studies on the infectivity of Anopheles stephensi, R. Knowles and B. C. Basu (*Jour. Malaria Inst. India, 5 (1943), No. 1, pp. 1–29, illus. 2*).—In extensive experiments on malaria, transmission by *A. stephensi* under controlled conditions appeared to indicate that temperature is a more important factor than atmospheric humidity. As to longevity, the percentage of survivors of this species proved to be highest at low temperatures and the higher relative humidities. At 50° F. and at all humidities between 50 and 100 percent, infection was not obtained with any species of malaria parasite, and at 100° and at similar humidities none of these mosquitoes survived long enough to become infective. Infection by *Plasmodium vivax* via this mosquito occurred at 60°–90°; the heaviest salivary gland infections, at 80°. No salivary gland infection was obtained with *P. malariae*, and gut infection with this species was generally limited to 70°–80°. Infection with *P. falciparum* occurred at 70°–90° and 50–100 percent relative humidity. The maturity and numerical density of gametocytes in the donor's blood played an important role in the infectivity of the mosquitoes.

Malaria control by spray-killing adult mosquitoes: Fourth season's results, P. F. Russell, F. W. Knipe, and N. R. Sitapathy (*Jour. Malaria Inst. India, 5 (1943), No. 1, pp. 59–76, illus. 2*).—The fourth season's findings from spraying houses, animal sheds, and outbuildings with pyrethrum insecticides to kill adult anopheline mosquito vectors in some South Indian villages of 100–7,600 population fully confirmed previous results in showing that the method is very effective in reducing malaria transmission; they also indicated that spray-killing is not a permanent measure but must be continued year after year. It is believed to have been demonstrated that this method is economically feasible as a malaria-control measure in rural South India.

A note on the rove-beetle Staphlinus masculosis Grav., P. Rau (*Ent. News, 55 (1944), No. 1, p. 15*).—Report of a case in which this beetle, known to be an insect feeder, had bitten its way into the skin of a dog, causing a large wound. It was probably attracted there by maggots.

Descriptions of three new species of Thrassis Jordan and the females of T. bacchi (Roths.) and T. pansus (Jordan), F. M. Prince (*Pan-Pacific Ent., 20 (1944), No. 1, pp. 13–19, illus. 8*).—Among the fleas collected during an investigation of plague distribution in the Western States, specimens of the genus *Thrassis* were obtained which are here described as new species. Females of *T. bacchi* (Rothschild) Jordan and *T. pansus* (Jordan) Jordan, not previously described, were also collected.

Sylvatic plague: The recovery of fleas from the burrowing owl and its burrow in a plague area in Alberta, J. H. Brown (*Ent. News, 55 (1944), No. 1, pp. 15–18*).—This owl (*Speotyto cunicularia*), inhabiting abandoned burrows of ground squirrels and badgers and known to kill its prey but also to feed on dead animals, was unusually abundant in a plague-epizootic area (1940–42). A total of 84 fleas were recovered from 4 burrows, and 2 of 11 birds harbored 1 flea each. One of these fleas was determined as *Oropsylla (Oropsylla) idahoensis* Baker, a known plague vector.

Ixodes neotomae, a new species from California (Acarina: Ixodidae), R. A. Cooley (*Pan-Pacific Ent., 20 (1944), No. 1, pp. 7–12, illus. 2*).—This new species of tick was found mainly on the wood rat (*Neotoma*).

Pollen and pollen substitutes in the nutrition of the honeybee, M. H. Haydak and M. C. Tanquary (*Minnesota Sta. Tech. Bul. 160 (1943), pp. 23+*).—Various foods were tested as pollen substitutes for bees, and only those colonies fed beebread, dried yeast, meat scrap, cottonseed meal plain or mixed with dry skim milk, fresh whole milk, dry skim milk, whole egg, egg yolk, and egg white produced a new generation of bees. When the value of foods most suitable from the economic viewpoint was compared with beebread, expeller-processed or solvent-extracted and heated soybean flour mixed with 20 percent of dry skim milk proved superior to beebread, while cottonseed meal and 20 percent dry skim milk were of lower value than beebread. For queen rearing, soybean flour mixed with dry skim milk was the most satisfactory inexpensive pollen substitute for bees. In the event of pollen shortage or adverse weather conditions the addition of a suitable substitute is deemed essential for the proper development of colonies under Minnesota conditions. Fifty-two references to literature cited are appended.

Honeybees increase clover seed production 15 times. (Ohio State Univ.). (*Gleanings Bee Cult., 72 (1944), No. 2, pp. 46–48, illus. 2*).—Covered from another source (E. S. R., 90, p. 667).

Formica rufa L. attacking colonies of honeybees, C. G. Butler (*Ent. Mo. Mag., 4. ser., 4 (1943), No. 40, p. 90*).

ANIMAL PRODUCTION

Conversion of feed to food, H. J. Almquist. (Univ. Calif.). (*Flour & Feed, 44 (1944), No. 8, p. 16*).—Estimates are presented of the efficiencies of different animals in converting feed proteins to human food.

Commercial feeding stuffs, 1942–43, E. R. Tobey (*Maine Sta. Off. Insp. 188 (1943), pp. 32*).—The guaranteed and found analyses of 554 samples of feeds officially examined in the State by methods previously noted (E. S. R., 88, p. 667).

The biological determination of vitamin E, H. Gottlieb, F. W. Quackenbush, and H. Steenbock. (Wis. Expt. Sta.). (*Jour. Nutr., 25 (1943), No. 5, pp. 433–440*).—When *dl*-α-tocopherol was given in graded doses to rats on a basal low-fat diet deficient in this vitamin supplemented with other vitamins, growth ceased when they attained a weight of 190 gm. at 10–12 weeks. Following breeding, the difference in gain in weight of control animals and experimental females was proportional within limits to the amount of vitamin E supplied. The same individuals could be used over and over, but when sufficient vitamin E had been supplied to allow the production of litters they should be allowed to suckle them to become depleted of vitamin E for further tests. With 20 gm. as the standard gain in weight made by controls, oral administration on successive days of 0.25 mg. of the vitamin caused an average increase in weight of 28 gm.; 0.5 mg., an increase of 36 gm.; and 0.75 mg., an increase of 44 gm. The upper limit of vitamin E inducing increases in body weight was 0.9–1 mg., which caused a body gain of 63 gm. or less. A high-fat diet did not prove satisfactory for assaying the vitamin A by this method, and the vitamin E requirement was increased. Synthetic α-, β-, γ-tocopherols and α-tocopheryl acetate caused relative biological activities of 100, 25, 19, and 100, respectively.

Pasture vs. dry lot for fattening cattle, R. R. Thalman (*Nebraska Sta. Bul. 354 (1944), pp. 20*).—In two 140-day comparative feeding tests on sweetclover or Sudan grass pasture or in dry lot feeding, slightly less corn and considerably less alfalfa hay were required per unit of gain with the pasture. One month's

pasturing of these crops replaced 27 lb. per 100 lb. of gain of corn and 198 or 199 lb. of alfalfa hay. The dry-lot steers were, however, better finished in both trials than those finished on pasture. In a 75-day test yearling steers consumed less corn and hay on Sudan grass pasture than others in dry lot. Average daily gains of 1.74 and 2.06 lb., respectively, were made by these groups, and the selling price of the dry-lot-fed steers was superior. In three trials with yearling steers of 168 to 190 days' duration, those fed on permanent pasture made an average daily gain of 2.31 lb., whereas those fed in dry lot made an average daily gain of 2.19 lb. Extremely dry weather conditions made it necessary to supplement pasture with alfalfa. Similar gains were made by calves full-fed shelled corn and alfalfa hay and alfalfa hay and corn silage when full-fed or pasture-fed. The largest and most economical gains were made by the steers wintered on silage and alfalfa hay and fed on pasture during the summer season. In a comparison involving steers wintered on corn silage and alfalfa hay, 1 month's pasture for a steer replaced 161 lb. of corn and 123 lb. of alfalfa hay. In two trials with yearling steers, those receiving ground ear corn made an average daily gain of 2.25 lb. whereas they averaged 2.40 lb. and 2.41 lb. for those receiving cracked corn and shelled corn, respectively.

The effect of rations on the production of urinary calculi in sheep, I. E. Newsom, J. W. Tobiska, and H. B. Osland (*Colorado Sta. Tech. Bul. 31 (1943), pp. 42, illus. 23*).—In trials of the effect of different rations on the production of urinary calculi, 7 lots of 96 lambs each were fed for 120 days on rations containing yellow or white corn with roughages of alfalfa, cane fodder, oat straw, or beet tops. Bran and molasses were fed with these rations in some lots. Tests were made of the water consumption and relation of these rations to the occurrence of calculi. Changes in the Ca, P, Mg, and other minerals in the blood and urine and the precipitate of the urine as the result of these feeds were ascertained. Since this trial indicated that alfalfa and beet tops were protective and that cane fodder, bran, and white corn were suspected, the effect of these feeds in various combinations with grains, bonemeal, lime, and molasses on the occurrence of calculi was investigated in a second experiment involving 20 lots of 25 lambs each fed for 125 to 140 days. Only two cases of calculi developed, and these were in a lot on milo grain, bran, and cane fodder. On slaughter, stones were found in some lambs but none in any receiving alfalfa or beet tops. In a 2-yr. experiment with 5 lots of 3 lambs each, no cases of calculi occurred with yellow corn and alfalfa, but calculi were developed by lambs receiving white corn with cane fodder and bran, even with cod-liver oil. The livers of this group were well depleted of vitamin A. In a fourth experiment, 4 lots of 5 lambs each received a good grade of alfalfa with rolled barley and minerals. No clinical cases of calculi were observed on slaughter in any of the lots after 200 days' feeding, but small sand particles were found in the kidneys of those receiving $CaCO_3$ or $MgCO_3$. The intake of Ca, P, Si, Mg, and other minerals was ascertained, as well as the composition of calculi observed.

Meeting wartime sheep production goals (*Oklahoma Sta. Cir. 114 (1943), pp. 8*).—A summary, by H. M. Briggs, of practices in sheep production which research and experience have shown to produce most efficiently a maximum of lamb and wool. Special emphasis is placed on the use of pasture, selection of good rams and ewes, improved management, and creep feeding for early lamb production.

Making more pork from less protein, E. F. Ferrin (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 2, pp. 4–5, illus. 2*).—The amounts of protein consumed by pigs per unit of gain were reduced by medium- and low-protein rations as contrasted with high-protein rations, although gains were made at a

slower rate. At from 73 to 125 lb. live weight the percentages of protein in the high-, medium-, and low-protein rations were 20, 17.5, and 15 percent. Above 125 lb., the percentages of protein were reduced to 17.5, 15, and 13.6 percent in these groups. The different percentages of protein in the rations were obtained by variations in the proportions of ground wheat, alfalfa meal, tankage, and soybean meal.

Feeding rice and rice byproducts to swine, C. I. Bray (*Louisiana Sta. Cir. 33 (1943), pp. 23, illus. 3*).—An abridgment of Bulletin 368 (E. S. R., 90, p. 514).

Poultry research (*Maine Sta. Bul. 420 (1943), pp. 510–512, 515–516*).—Sex-linked hatching eggs from Barred Plymouth Rock hens crossed with Rhode Island Red males were produced in large quantities during January. The demand for Rhode Island Red and New Hampshire hatching eggs was also high in this period. The number of Barred Plymouth Rock hatching eggs was at its peak during June because the chicks were used for meat purposes. Seasonal variations in hatchability in each breed are tabulated. Early hatching chicks were found more likely to be females than males. They were healthier and showed a tendency for higher hatchability of the eggs and they laid earlier and with more persistence than hens hatching later. Apparently chicks may thus be selected by hatching date.

The maintenance of high fertility in poultry flocks, F. P. Jeffrey (*New Jersey Stas. Hints to Poultrymen, 31 (1943), No. 1, pp. [4], illus. 1*).—A ratio of 1 male to 18–20 hens is recommended for breeding Leghorns and 1 male to 12–15 hens for breeding Reds and Rocks. Maximum fertility is realized by mating cockerels with pullets or cockerels with yearling hens. Dubbing cockerels reduced injury from freezing combs, and there was no difference between dubbed and undubbed birds in body size, sexual activity, or yield of semem.

Directory of U. S. Register of Merit sires and dams qualifying under the National Poultry Improvement Plan (1941–42 trap-nest record year), A. B. Godfrey and P. B. Zumbro (*U. S. Dept. Agr., Misc. Pub. 539 (1943), pp. 57+*).—The sires and dams that qualified during the 1941–42 trap-nest year for the U. S. R. O. M., classified by breeds, are presented, including the records of the dams or sires' dams and the name of the breeder and other pertinent information including viability of daughters.

Protein and vitamins for poultry, H. J. Sloan (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1943), No. 1, pp. 6–7, illus. 2*).—The needs for protein and several vitamins by the laying hen and growing chicks are emphasized.

Growth-promoting activity of betaine in the chick, H. J. Almquist and C. R. Grau. (Univ. Calif.). (*Jour. Biol. Chem., 149 (1943), No. 2, pp. 575–576*).—Chicks depleted of choline increased their daily weight gains from about 2 percent on a basal diet to nearly 4 percent with 0.2–0.3 percent of betaine hydrochloride and over 4 percent with 0.5 percent methionine. When 0.2 percent choline chloride was added to the basal ration, the groups of chicks gained about 4 percent per day.

Alimentos de emergencia para gallinas ponedoras [Feeding of emergency ratios to laying hens], E. L. Willet and E. S. Vilella (*Agr. Expt. [Puerto Rico Univ. Sta.], 3 (1943), No. 3, pp. 7–9*).—In 4 lots of 20 hens each, better egg production and hatchability were obtained over a period of 13 days with a ration containing 33.5 percent roasted soybeans than with 22 percent peanut meal. The soybean and peanut rations were fed with and without cod-liver oil.

Pastures for growing pullets, J. E. Parker and B. J. McSpadden (*Tennessee Sta. Bul. 188 (1944), pp. 14, illus. 6*).—Continuing the study of pastures for hens (E. S. R., 90, p. 517), comparison was made of spring oats; a mixture of ryegrass, Korean lespedeza, and Kobe lespedeza; alfalfa; and bare range in four

different lots for growing pullets. In each of 3 yr., 125 unsexed Barred Plymouth Rock chicks were started in each of 4 lots which were 50 by 140 ft. All groups were fed, ad libitum, a growing mash which included cereals, alfalfa leaf meal, meat meal, dried skim milk or dried whey, fortified cod-liver oil, and minerals. Oats were found to produce excellent pasture, but by the latter part of May or the first part of June the plants head out and the leaves become tough and unpalatable. Ryegrass and lespedeza proved an excellent combination for continuous grazing, but should not be pastured too heavily in the late season after seeds mature. Alfalfa provides succulent green feed during the late summer and makes best grazing when cut several times during the season. To 12 weeks of age there was little difference in the weights of the pullets, but from 12 to 28 weeks pasture-fed pullets were consistently heavier than those fed in bare yards, except the oat-pastured group from 12 to 20 weeks. At 28 weeks of age those on alfalfa averaged 0.3 lb., those on oat pasture 0.15 lb., and those on ryegrass and lespedeza 0.16 lb. more than those on bare range. The pastured pullets were more uniform in size, pigmentation, and condition of the feathers in each of the 3 yr. The average mortality was 9.5 percent for all pullets on pasture and 13 percent for those on bare range. The total feed consumption was about the same with and without pasture, but the proportion of mash was greater when no pasture was available. Of the three pasture groups, alfalfa proved of greatest value in furnishing continuous green feed and producing superior pullets. Spring oats were not satisfactory because they furnished green feed for such a short time.

A comparison of a pelleted and unpelleted all-mash diet for growing chickens, B. W. Heywang and R. B. Morgan. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 1, pp. 16–20*).—Continuing the studies of pelleting feeds for chickens (E. S. R., 85, p. 235), in all of six experiments involving over 600 chicks on each ration, the 12-week-old Single-Comb White Leghorn cockerels that had received a pelleted all-mash ration were significantly heavier than corresponding groups that had received similar unpelleted feeds. In general, the feed consumption of pullets to 22 weeks of age was greater on the pellets, and age of laying the first egg was reduced as contrasted with groups on unpelleted all-mash rations.

High protein mashes for broilers, H. J. Almquist and V. S. Asmundson. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 1, pp. 67–71, illus. 2*).—Groups of 25–26 White Leghorn cockerels were started on rations containing about 20 and 30 percent protein with changes from higher to lower or vice versa or kept at the same protein level at weekly intervals up to 8 weeks of age. Weights and feed consumption were ascertained. Birds started on the high protein mash grew more rapidly during the first week, but there was no consistent difference in the percentage rate of growth thereafter. The broilers utilized the higher protein percentage mash more efficiently as less feed was required per unit of gain during the first week, but the differences were decreased as age increased. These differences did not continue in birds transferred from the higher to the lower protein levels. The study was repeated in three experiments with similar results.

The use of soybean meal in the diet of growing chicks, J. C. Hammond and H. W. Titus. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 1, pp. 49–57*).—Studies were conducted on the growth of 64 lots of 34–40 Rhode Island Red chicks fed to 6 and 10 weeks of age when receiving rations in duplicate lots of cereals with protein supplements and meat scrap, dried skim milk, blood meal, dried whey, sardine meal, casein, or other sources of animal proteins mixed or singly. Certain lots had all or part of the animal proteins replaced by plant proteins from fresh, fermented, or autoclaved soybean meal, alfalfa leaf meal,

B–Y feed, and yeast cells. In the absence of all animal proteins 35 percent of soybean meal was required to support rapid growth to 10 weeks of age. Small amounts of soybean meal singly or in combination with peanut meal or cottonseed meal were not satisfactory. The soybean rations were improved by additions of small quantities of meat scrap, dried skim milk, or sardine meal. The protein of yeast failed to supplement soybean protein. For optimum results from soybean meal it must be heated but not overheated, and it must be adequately supplemented with vitamins and minerals for best results.

Factors affecting the nutritive value of soybean oil meals and soybeans for chickens, H. R. Bird and G. J. Burkhardt (*Maryland Sta. Bul. A27 (1943), pp. 35–52+, figs. 2*).—The average weight at 9 weeks of age of groups of 30–32 chicks receiving seven brands of soybean meal as the sole protein supplement to a mixed cereal ration varied from 613 to 871 gm. When 4 percent of fish meal was supplied with the soybean meal in 7 other lots, average weights at 9 weeks ranged from 673 to 930 gm. There was no distinction between the effects of expeller and solvent soybean meals. Heating the meal at 104° or 128° C. did not produce meals comparable to the best heated commercial meals. There was definite possibility of impairment of the feeding value by overheating at 128°, but little likelihood of overheating at 104°. Better growth was obtained by mashes containing 15 percent each of soybean meal and corn gluten meal than by mashes containing 30 percent of soybean meal as the sole protein. Passing whole soybeans through a grain drier at a temperature of 103° for 42 min. improved their feeding value.

Partial substitutes for soybean meal, J. C. Hammond. (U. S. D. A.) (*Poultry Sci., 23 (1944), No. 1, p. 78*).—As much as 15 percent cottonseed meal, corn gluten meal, peanut meal, or ground hempseed were found to replace satisfactorily an equal weight of soybean meal in certain chick rations.

Crab meal in poultry rations.—II, Chick and broiler rations, R. T. Parkhurst, M. S. Gutowska, J. A. Lubitz, and C. R. Fellers. (Mass. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 1, pp. 58–64*).—Continuing the study of crab meal rations (E. S. R., 89, p. 582), rapid growth and good feathering, pigmentation, and feed efficiency were obtained by chicks on rations containing dried crab meal in place of all of the meat and skim milk in the New England College Conference ration. There were conducted two experiments of 8 and 14 weeks' duration, the first with 2 lots of 42 Single-Comb White Leghorn cockerels and the second with 4 lots of 20 Rhode Island Red × Barred Plymouth Rock chicks. The ratio of calcium to phosphorus seemed to be an important factor in determining the results obtained. Chicks grew less rapidly when crab meal was used and the high ratio of calcium to phosphorus was not reduced. The flavor of the cooked meat was not objectionable. Five percent of dried skim milk was satisfactorily replaced in the ration by 3 percent of fish meal.

Dehydrated pea vines and starfish meal in poultry feeds, H. R. Bird. (Md. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 1, pp. 76–77*).—Starfish meal at 3 percent levels effectively supplemented a chick mash in which soybean meal was the only high-protein feed. The shank color and growth to 9 weeks of age were improved by additions of the starfish meal to the basal ration. Likewise dehydrated pea vines were a good substitute for alfalfa meal at 5, 10, and 15 percent levels.

Effect of manganese and iodine additions in a specific ration for laying hens, F. E. Mussehl (*Nebraska Sta. Cir. 76 [1944], pp. [4]*).—There was no satisfactory evidence that egg production, hatchability, and viability of the hens were limited by manganese and iodine. The study was conducted over a 9-mo. period, from September 1 to June 1, with 3 lots of 250 Leghorn hens each on a

typical farm ration of corn, wheat, oats, barley, alfalfa, and green feed. There was added to the ration of one lot 4 oz. of manganese sulfate per 1,000 lb. of ration. Another lot received in addition two parts of stabilized potassium iodide per million parts of mash. The control received none of the supplements. The cost of manganese and iodine is low, and the possibility that occasionally they may be beneficial at the experimental levels is recognized.

The influence of dietary factors on egg shell quality, I, II, R. J. Evans, J. S. Carver, and A. W. Brant. (Wash. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 1, pp. 9–15; 36–42, illus. 1*).—Two papers are included:

I. *Phosphorus.*—Eleven lots of 8–15 Single-Comb White Leghorn pullets served for comparison of rations containing from 1.5 to 3 percent of calcium and 0.6 to 1.2 percent of phosphorus on production and eggshell weight and quality in two experiments. During the first 4 mo. 0.8 percent phosphorus generally gave better results than 0.6, 1, or 1.2, with 2.5 percent of calcium, when eggshell thickness served as the criterion. There were no significant differences between 0.8, 1, and 1.2 percent phosphorus during the last 6 mo. At a level of 3 percent calcium, 0.8 percent phosphorus was no better than 1 percent, but the reason was not clear. The different sources of calcium and phosphorus supplements used in these tests included dicalcium phosphate, bonemeal, and defluorinated rock phosphate. The phosphorus was satisfactorily and equally utilized from the last two supplements.

II. *Calcium.*—The comparative effects of rations containing 1, 1.5, 2.5, 3, and 3.5 percent calcium with 0.6, 0.8, or 1 percent phosphorus on egg production and shell weight and quality were investigated. More satisfactory results were obtained with 3 percent calcium than with larger or smaller amounts. A calcium level of 2.5 allowed as satisfactory production. Egg production and shell quality were much decreased when the calcium level was reduced to 1 percent, and calcium was withdrawn from the bones.

Calcium for egg shells, D. C. Kennard (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 27–32*).—The essentiality of some suitable source of calcium in the form of calcium carbonate for eggshell formation and maximum egg production is emphasized. In 2-yr. tests of calcium carbonate supplements for layers, the groups which received oystershell averaged 20 more eggs per bird than did those that received dolomitic magnesia limestone grit (80 percent calcium carbonate) and 42 more eggs per bird than the groups that received no calcium carbonate supplement. In a 10 weeks' test with pullets which received the same ration with and without oystershell, the respective total number of unbroken eggs was 1,438 and 977, and the broken eggs 7 and 53. The primary advantage of oystershell is its standardized nature with 95 to 98 percent calcium carbonate, whereas limestone is a highly variable product and requires a close checking of its calcium and magnesium content when used for poultry feeding.

Additional observations on the chick antianemia vitamin, B. L. O'Dell and A. G. Hogan. (Mo. Expt. Sta.). (*Jour. Biol. Chem., 149 (1943), No. 2, pp. 323–337, illus. 2*).—In further study of the chick antianemic factor (E. S. R., 82, p. 808), which was confirmed by Mills et al. (E. S. R., 88, p. 669), chicks were fed in lots of eight on the basal ration with different supplements. Approximately the same degree of anemia was indicated by the red cell volume, erythrocyte count, and hemoglobin contents of the blood. The red cell volume becomes larger when the anemia begins to develop. Two hematocrit values served to indicate when a chick was anemic. The most satisfactory assays were made when the red cell volume reached 20 percent, corresponding to a hemoglobin value of 4.26 gm. per 100 cc. of blood and to a red cell count of 1.11 millions per cubic millimeter. The preparation to be assayed was ad-

ministered orally on alternate days for 12 days with the hematocrit reading obtained on the fourteenth day. A chick unit of vitamin B_c was the amount necessary to bring the hematocrit reading from 20 to 30 percent in at least 60 percent of the chicks. The basal ration was a simplified diet including as far as possible synthetic vitamins. Study of anemic conditions showed that some of the known vitamins and disinfectants influenced the occurrence of anemia possibly through their action on bacteria. Chemically, vitamin B_c is acidic in nature and forms salts with heavy metals. It was very labile to acid but somewhat more stable to alkali, is adsorbed from acid solutions by a variety of adsorbents, and can be eluted by ammonia but is insoluble in the common organic solvents.

Abnormal feathering of pen-reared bobwhites, R. B. Nestler and L. M. Llewellyn (*Poultry Sci., 23 (1944), No. 1, pp. 72–75, illus. 2*).—In two experiments designed to study optimum levels of dried milk products for quail, an abnormal juvenal feather growth involving a curved, twisted, and stunted condition occurred among many of the birds. The situation was most severe when no milk products were included in the ration. The condition was improved with increased amounts of dried buttermilk, but 12 percent showed abnormal feathering on a ration containing 15 percent dried buttermilk as contrasted with only 10 percent on rations containing 12.5 percent dried buttermilk. The feather abnormality was prevented by riboflavin additions to a control ration, but it was only slightly reduced in occurrence by pantothenic acid. The malformations occurred more frequently among birds receiving vitamin A and D feeding oil fortified than among those receiving D-activated sterols.

DAIRY FARMING—DAIRYING

Dairy farming in the South, R. H. Thomas, P. M. Reaves, and C. W. Pegram (*Danville, Ill.: Interstate, 1944, pp. 374, illus. 154*).—The elements of dairy farming are reviewed, with attention to selecting, judging, breeding, management, and feeding of dairy cattle and improved practices of dairy farming and marketing dairy products.

Feeding and managing the herd for wartime production, H. A. Herman. (Univ. Mo.). (*Guernsey Breeders' Jour., 65 (1944), No. 5, pp. 360–361, 368*).—In meeting the demands for continued high milk production under wartime requirements, emphasis is placed on feeding well-balanced rations and providing a maximum of pasture and roughage.

A plan to meet milk production requirements for 1944, J. S. Moore (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 2, pp. 1, 7*).—Good breeding, management, and graizng are recommended for dairy cattle to obtain maximum milk production.

Feeding dairy cows in 1944, H. B. Ellenberger (*Vermont Sta. Pam. 8 (1944), pp. 14*).—General directions for feeding dairy cows, with special reference to roughages, including hay, pasture, and silage.

Fat in the dairy grain mixture, C. F. Monroe and W. E. Krauss (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 15–26, illus. 1*).—In five trials with dairy cattle, high-, medium-, and low-fat rations had no significant effects on the milk or butterfat production or live weight changes. The newborn calves were about equal in birth weight and skeletal development from the cows receiving levels of fat from 2.69 to 4.89 percent. The differences in the fat percentages of the ration were produced by decreases or elimination of linseed meal or soybean meal or changes in amounts of ground soybean meal. The number of cows was variable up to 70 individuals for feeding periods of nearly 150 days.

A comparison of alfalfa-brome grass silage and corn silage for dairy cows, R. K. Waugh, S. M. Hauge, J. W. Wilbur, and J. H. Hilton. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 10, pp. 921–928, illus. 2*).—The data reported have been previously noted (E. S. R., 90, p. 520).

The preservation and feeding of carrots as combination silages, A. E. Perkins, C. C. Hayden, W. E. Krauss, R. G. Washburn, and C. F. Monroe (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 10–14*).—Silage mixed at the rate of 25 tons of corn to 1 ton of Danvers carrots (including tops) was in good physical condition 2 mo. after silo filling. Carrots similarly ensiled with fresh-cut green alfalfa were silghtly softer than those ensiled with corn. In two tests these silages were highly palatable to cows, and good returns in milk and butterfat were produced. A favorable effect was noted on the carotene content of these products.

The comparative value of urea and linseed meal for milk production, I. W. Rupel, G. Bohstedt, and E. B. Hart. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 8, pp. 647–664, illus. 3*).—Conforming with indications that urea could supply the protein N, at least in part, for calves (E. S. R., 82, p. 239), it was found in studies with dairy cattle that urea containing 46 percent N could be used effectively up to about 3 percent in replacing linseed meal. There were used for these studies four lots of six grade Holstein cows which were carried through three lactations on different rations with varying amounts of urea or linseed meal as supplements to the basal ration of ground corn and oats. Urea and corn molasses were fed with the ration of another group. The linseed meal was fed at the rate of 34 percent, urea 3 percent, and urea and corn molasses 3 and 10 percent, respectively. The cows were rotated so that all were on the basal ration or the ration with the urea or linseed meal supplements. When adjusted to a mature basis for 4 percent milk, the production on the basal ration was 6,675 lb., linseed meal 7,790 lb., and urea 7,690 lb. by the 15 cows on the three rations for different lactations. Statistical tests showed differences between the linseed meal and basal rations and the urea and basal rations to be significant, but differences between production on the urea and urea-molasses rations were not significant. The amounts of concentrates consumed per 100 lb. of 4 percent milk were 37.2 lb. for the basal ration, 35.7 lb. for the linseed meal, and 35.6 lb. for the urea ration. The composition and flavor of the milk and composition of the blood were not affected by the urea, linseed meal, or the basal rations fed. The molasses feeding with urea had no sustained effect on urea utilization by the cattle of this age.

Bloat in cattle and composition of rumen gases, M. Kleiber, H. H. Cole, and S. W. Mead. (Univ. Calif.). (*Jour. Dairy Sci., 26 (1943), No. 10, pp. 929–933, illus. 1*).—In connection with earlier studies of bloat in cattle (E. S. R., 87, p. 413) the hydrogen sulfide content of the rumen gas of bloated and non-bloated cows receiving different roughages was found to bear no relation to the occurrence of bloat. The proportion of carbon dioxide, methane, and oxygen in the rumen gas was also not related to the occurrence of bloat, which is considered to be due to a lack of belching. Methods for removing gas by a trocar and analyzing it are described.

Influence of length of dry period upon the quantity of milk produced in the subsequent lactation, J. W. Klein and T. E. Woodward. (U. S. D. A.). (*Jour. Dairy Sci., 26 (1943), No. 8, pp. 705–713, illus. 2*).—By increasing the dry period from 0 to 1 mo. to from 1 to 2 mo. the yield of milk in the next lactation was found to be increased 9.19 percent. Smaller increases were associated with longer dry periods. For 200 cows, of which the exact date of drying off was known, the application of these data to 1,139 comparisons made possible the derivation of the formula $Y=105.28-33.98(0.9667)^x$, wherein $Y=$

the percentage of average yield of 4 percent milk on the mature basis and X=the number of days dry. A dry period of 55 days was the optimum for cows yielding 10,000 lb. of milk and calving at yearly intervals. The comparisons were made from 15,442 lactations reported for dairy herd improvement records.

Vitamin A activity of milk as related to pasture and feeding practices in Alabama, C. J. Koehn. (Ala. Polytech. Inst.). (*Jour. Dairy Sci., 26 (1943), No. 8, pp. 673–681, illus. 2; abs. in Biol. Abs., 17 (1943), No. 10, p. 2346*).—"Milk produced by a well-fed herd of Jersey cattle varied from 150γ of vitamin A and 100γ of carotene per quart in February to 535γ of vitamin A and 1,020γ of carotene per quart in August. The vitamin A and carotene content was primarily dependent upon the quality of the pasture; the concentrates and roughages fed were low in carotene and produced milk of low vitamin A activity if not supplemented with pasture. Temporary winter pastures were used to produce milk of high vitamin A-carotene content during the winter."

The vitamin A requirements of dairy cows for production of butterfat of high vitamin A value, II, III. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 1, pp. 57–62, illus. 3; pp. 63–66*).—Two additional reports on this series of investigations (E. S. R., 84, p. 235) are noted.

II. *Vitamin A per se,* J. H. Hilton, J. W. Wilbur, and S M. Hauge.—In two feeding experiments, each involving two Guernsey cows, in which a low vitamin A basal ration was supplemented with graded levels of fish-liver oil, maximum vitamin A value in the butter was secured at a daily intake of 200,000 units of vitamin A. It is concluded that vitamin A per se (fish-liver oil) is approximately three times as effective as carotene in dehydrated alfalfa hay.

III. *Availability of carotene in dehydrated alfalfa hay as compared with carotene in oil,* S. M. Hauge, R. J. Westfall, J. W. Wilbur, and J. H. Hilton.—In further similar experiments with Guernsey cows the low vitamin A basal ration was supplemented with varying levels of dehydrated alfalfa hay or crystalline carotene suspended in oil. Based on the vitamin A concentration in the butter, it is concluded that dairy cows can utilize the carotene from the alfalfa hay as readily as isolated carotene.

The use of first records versus the average of all records in dam-daughter comparisons when proving sires, D. N. Putnam, G. A. Bowling, and C. T. Conklin. (W. Va. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 10, pp. 967–973*).—A comparison of milk production records for the daughters of 169 Ayrshire sires and 3,388 dam-daughter pairs showed only a small and insignificant difference in the results obtained in the earlier records and those made at later ages. The first records, calculated on a mature equivalent basis, averaged slightly higher than when account was taken of records at more advanced ages. It is suggested that a real saving in labor can be made by using the first records only in dam-daughter comparisons.

Composite vs. fresh samples of milk for determining percentage butterfat of cows on herd test, T. M. Olson. (S. Dak. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 8, pp. 665–672*).—The percentage of butterfat and the average pounds of milk from 443 cows representing 4 breeds, collected over an 8-yr. period, were as accurately indicated by 3-day composite samples as by daily official samples for advanced registry tests. The results by the two methods were strikingly similar.

The rôle of surface-active constituents involved in the foaming of milk and certain milk products, I, II, M. S. El-Rafey and G. A. Richardson. (Univ. Calif.). (*Jour. Dairy Sci., 27 (1944), No. 1, pp. 1–18, illus. 8; pp. 19–31, illus. 3*).—Lists of 50 and 24 references are included with the first and second papers, respectively.

I. *Milk proteins.*—This initial report of a systematic study of the fundamental foam problem in milk products describes an apparatus devised for accurate measurements of the foaming properties of milk and also the units of foam measurements used in the study, including a unit designated as "half-volume time," which proved particularly useful. A new procedure for isolating undenatured casein of very low lipid content also is described. From the studies of the foaming properties of solutions of purified milk proteins it is shown that calcium caseinate solutions of a concentration equivalent to that of milk have high foam stabilities at temperatures below 40° C. Solutions of α-β-lactalbumin foamed well at all temperatures, while lactoglobulin solutions showed no appreciable foaming. Milk fat exerted the greatest foam-depressing action at temperatures above 15° with calcium caseinate solutions and at temperatures lower than 35° with lactalbumin solutions.

II. *Whey, skimmed milk, and their counterparts.*—Studies were carried out on synthetic solutions of milk proteins and fats prepared to duplicate the essential foaming characteristics of whey and skim milk. It is concluded that lactalbumin and milk fat are the constitutents that influence the foaming of whey, while in milk or skim milk the foaming properties are determined by calcium caseinate, milk fat, and lactalbumin. It is considered that calcium caseinate is preferentially adsorbed at the air/liquid interface at temperatures below the melting point of milk fat, lactalbumin being adsorbed at higher temperatures. The presence of milk fat globules is shown to be responsible for the minimum foaming of separated milk at certain temperatures. The addition of milk fat emulsion to blood serum brings about a minimum foaming at room temperatures.

A critical study of the United States Public Health Service definition for homogenized milk, with some recommendations, F. J. Doan and R. W. Mykleby. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 10, pp. 893–907, illus. 3*).—In a critical study of the definition of homogenized milk, the method found most satisfactory for separation of the upper layer of 100 cc. of a quart bottle was by a specially constructed siphon. When the temperature of gravitation was varied from 32° to 50° F., differences of approximately 70 percent were found, but delayed gravitation did not appreciably influence results. Indices at 24-hour intervals were found approximately 50 percent as effective as values obtained after 48 hr. High-temperature pasteurization slightly inhibited the rise of fat. A substitute method of indicating homogenization efficiency was offered by the fat globule size. When the U. S. Public Health Service index was lower than 10, further heating did not cause reduction in the curd tension by elevating the homogenization pressure, but the wear on the machinery was greater. "A definition of homogenized milk might be stated in terms of the Modified Farrall index, in which case a value of 12.0 would appear to be a satisfactory limit."

Factors affecting the development of acidity in pasteurized skim milk inoculated with commercial lactic starters, N. S. Golding, H. Amundson, and R. O. Wagenaar. (Wash. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 10, pp. 909–919, illus. 4*).—The optimum temperature for the development of acidity in skim milk by three commercial starters was found to be at about 86° F. There was little development of acidity in 8 hr. at 60° and 100°. The milk used ranged in acidity from 0.15 to 0.175 percent, with inoculation by commercial lactic acid cultures in powdered and liquid form. The acidity of fresh starters usually found in the cheese factory had little effect on the rate of acid development in skim milk; neither did the use of fresh or refrigerated starters. Retardation in the development of acid followed cooking temperatures of 102° and depended on the length of time over which the starter organisms were scalded.

Influence of various treatments on the bacteria content of frozen cream, F. W. Fabian and G. M. Trout. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 10, pp. 959–965*).—In further studies of frozen cream (E. S. R., 90, p. 244), bacteriological plate counts were made of the samples pastuerized for different periods after collection at monthly intervals and stored frozen for 6-mo. periods. The greatest reduction in bacteria occurred in the samples pasteurized at 185° F. for 5 min., as contrasted with pasteurization at 150° for 30 min. and 165° for 15 min. There was an increase in the plate count when homogenization pressure was greatest. Addition of 1 p. p. m. of copper or 10 percent sucrose, or the two together, or storage in glass, paper, or tin containers had no influence on the bacterial count, but there was a decrease in count when stored over a period of 1 yr. The studies included the effects of homogenization pressures of 0, 1,500, and 3,000 lb.

Observations on fishiness in butter, R. V. Hussong, S. Quam, and B. W. Hammer. (Iowa Expt. Sta. et al.). (*Jour. Dairy Sci., 27 (1944), No. 1, pp. 45–51, illus. 1*).—From a study of both fishy and nonfishy lots of commercial butter it was ascertained that the fishy samples commonly had lower pH values than nonfishy samples from the same plant. The high pH value in fishy butters was generally associated with large amounts of copper. When fishy butter was separated into fat and serum the fish flavor was conspicuous in the fat but not in the serum.

Effect of growth of Pseudomonas putrefaciens on diacetyl and flavor of butter, P. R. Elliker and B. E. Horrall. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 10 pp. 943–949, illus. 2*).—Observations on commercial and laboratory samples of butter inoculated with a culture of *P. putrefaciens* showed the first stage of decomposition to be a complete loss of typical butter aroma, followed by a cheesy or putrid flavor. Although the diacetyl content of sterile butter to which diacetyl was added after washing and partial working remained fairly constant during 7 days' storage at 21.1° C., more than half of the diacetyl was destroyed when butter similarly handled was inoculated with *P. putrefaciens*. Evidently this organism is more prevalent in the production of flat-flavored butter than is generally realized.

Chlorine resistance of Pseudomonas putrefaciens, H. F. Long and B. W. Hammer. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 1, pp. 39–43*).—When 2-day cultures of *P. putrefaciens*, grown on the authors' special agar medium previously described (E. S. R., 85, p. 102), were suspended in sterile distilled or pasteurized and filtered well water, the bacteria were easily destroyed by chlorine except when excessive numbers of cells were present. The destruction was more active in the distilled water than in the well water. Among the strains tested there was some evidence of variation in chlorine resistance. The excellent agreement obtained between growth of *P. putrefaciens* on the special agar and production of the putrid defect in unsalted butter at 21° C. indicates that this medium is particularly useful in such studies.

VETERINARY MEDICINE

Manual of veterinary clinical pathology, D. L. Coffin (*Philadelphia 6, Pa.: Col. Offset Press, 1944, pp. 120+, illus. 55*).—This manual deals with microscopic technic; how to collect, pack, and ship specimens; parasitologic examinations; urine and hematologic examinations and their interpretation; diagnosis of various specific diseases; semen examination; poultry and game bird autopsy; solutions and reagents formulas; and stains and technic.

Diseases of animals—prevention and treatment, T. Dalling (*Jour. Roy. Agr. Soc. England, 104 (1943), pp. 18–27*).—This article summarizes recent work

(41 references) on tuberculosis, mastitis, contagious abortion (brucellosis), infertility with special reference to trichomoniasis, phenothiazine as an anthelmintic, chemotherapy in the treatment of animal diseases, and swine fever.

Present and post-war health problems in connection with parasitic diseases, W. H. Wright (*Science, 99 (1944), No. 2568, pp. 207–213*).—This address before the American Public Health Association discusses some prospective problems as regards the post-war status as to protozoal diseases and nematode, cestode, and trematode parasites and the introduction of disease vectors.

Quantitative Untersuchungen über die Virulenz [Quantitative investigations on virulence], I, II (*Zentbl. Bakt. [etc.], 1 Abt., Orig., 150 (1943), No. 1–2, pp. 17–25, illus. 4; pp. 25–32, illus. 3*).

I. *Mitteilung: Eine Virulenzgleichung und ihre biologische Deutung [Virulence equalities and their biological interpretations]*, G. Bonezzi, L. Cavalli, and G. Magni.—The existence of a linear relation between the death times of animals infected with different doses of bacteria and the logarithms of the appropriate infection doses of *Bacillus anthracis* is shown and interpreted in this mathematical discussion. From their relationship a new method for the evaluation and analysis of virulence in pathogenic organisms is developed, with the aid of a separation of the two fundamental factors of virulence, their reproduction velocity and toxicity.

II. *Mitteilung: Die bakteriostatische Wirkung der Sulfanilamide in vivo [The bacteriostatic effect of sulfanilamide in vivo]*, L. Cavalli and G. Magni.—The above methods are applied to the use of several sulfa derivatives in combating the pneumococci.

Age of animals and drug action, K. K. Chen and E. B. Robbins (*Jour. Amer. Pharm. Assoc., Sci. Ed., 33 (1944), No. 3, pp. 80–82*).—Eight drugs were studied with various age groups of guinea pigs, rats, and mice. The authors conclude that it is impossible to predict how far the age of animals will influence the drug action, each substance having its own characteristics.

Plant problems in relation to diseases of livestock, C. Wright (*Vet. Rec., 55 (1943), No. 39, pp. 357–358*).—This is an address on the harmful effects of vegetation on animals, with special reference to variations in plant toxicity in different soils and climates and the absorption of toxic substances by plants.

A fluorescent alkaloid in rye-grass (Lolium perenne L.).—V. Toxicity, photodynamic action, and metabolism of perloline, I. J. Cunningham and E. M. Clare (*New Zeal. Jour. Sci. and Technol., 24 (1943), No. 4B, pp. 167B–178B*).—"Perloline," isolated by Grimmett and Melville as noted on page 4, was found to produce mild toxic and photodynamic effects when introduced parenterally into animals of various species. Such effects were not induced in sheep by oral administration. The alkaloid is rapidly destroyed in animals after administration by intravenous, intraperitoneal, or oral routes. It is concluded that the amounts of perloline ingested by grazing animals are unlikely to cause harmful effects.

Formulário de terapêutica veterinária [Formulary of veterinary therapeutics], C. Neiva (*Rio de Janeiro: Min. Agr., Serv. Inform. Agr., 1942, pp. 307+*).

Veterinary surgery notes, E. R. Frank (*Minneapolis, Minn.: Burgess Pub. Co., 1944, rev., pp. 237+, illus. 218*).—A revised edition (E. S. R., 88, p. 383).

The aetiology of East Coast fever, W. O. Neitz (*Jour. So. African Vet. Med. Assoc., 14 (1943), No. 2, pp. 39–46*).—The suggestion is advanced that East Coast fever is in fact a combined infection of at least two factors: (1) A protozoal parasite *Theileria parva* and (2) probably a "virus," and that the sterile immunity in this disease is due to the latter. "No modification in present con-

trol measures [is] envisaged or even worth considering until the validity of this thesis has been thoroughly explored and satisfactorily established."

Relação imunológica entre o virus da encefalomielite equina, isolado na Baía, e o virus rábico [Immunological relation between the virus of equine encephalomyelitis, isolated in Bahia, and rabies virus], R. Cunha (*Bol. Min. Agr. [Brazil], 31 (1942), No. 10, pp. 1–2*).—Serological and immunological tests are briefly referred to.

Brain-tissue neutralization: A new biological reaction for rabies virus, its relation to the protection and serum-neutralization tests, V. Kubes and F. Gallia (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 2, pp. 48–60*).—The brain-tissue neutralization test is described and stated to be "a true image of the antirabies immunity of the organism." Its results constantly agree with those of the protection test in vivo and show the same specificity. The serum neutralization test, however, gave positive tests even when the antirabies immunity of mice was precarious or absent, and by this test it was not possible to distinguish between two heterologous rabies viruses.

Vier neue Mitglieder der Salmonella-Gruppe [Four new members of the Salmonella group], K. Rauss (*Ztschr. Immunitätsf. u. Expt. Ther., 103 (1943), No. 3, pp. 220–227*).—The cultural and serological properties of four new *Salmonella* types are described.

Zur Kultur des Bact. paratuberculosis auf Hohns Substrat 4 [Cultures of B. paratuberculosis in Hohn's substrate 4], B. Albrecht and E. Nagel (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 150 (1943), No. 1–2, pp. 53–55*).—Attenuated but in the original form, Hohn's substrate 4 is deemed well adapted for experimental work with *B. paratuberculosis*.

Kalvympning vid bekämpandet av den smittsamma kastningen (The inoculation of calves for the combating of infectious abortion), P. Viridén (*Skand. Vet. Tidskr., 33 (1943), No. 12, pp. 737–745; Eng. abs., p. 745*).—The author recommends the inoculation of calves in herds infected with infectious abortion, using strain No. 19 of the U. S. D. A. Bureau of Animal Industry when the calves have reached the age of 4–6 mo.

Observations on clinical acetonaemia in the cow in the Island of Jersey, A. Messervy (*Vet. Rec., 55 (1943), No. 42, pp. 379–382*).—Case reports are given which indicate that this post-parturition condition is essentially associated with intensive mammary activity and is not connected with uterine infection. Intravenous injections of glucose given early in the course of the disease and repeated were found to have a marked effect, recovery following without marked drop in milk and body condition.

Systematic combating of brucellosis, with a special view to large herds, H. C. Bendixen (*Skand. Vet. Tidskr., 33 (1943), No. 12, pp. 705–736, illus. 5*).—An account is given of the combating of brucellosis in three large herds where the work has been based on systematic vaccination of the heifers at the age of 6–10 mo., together with anti-infectious measures and blood examination once or twice a year. "This regimen has regularly resulted in a marked fall in the number of reactors, so that the reactor percentage within a couple of years has fallen below 10. At this stage it will be economically practicable to clear the herds completely by sale of the reactors. This working method ought to be employed in large herds where the owners wish to take up the combating of brucellosis, and the work along these lines will also be suitable and practicable for a rational combating of the infection in a given dairy district."

Calfhood vaccination against brucellosis, E. D. Hubbard. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 803, pp. 84–85*).—Testing of animals vaccinated as calves after the lapse of 18 mo. showed some reactors, and

allowing more than 18 mo. did not reduce the percentage materially. It is concluded that if these findings are confirmed in further experiments, "it will be necessary to evaluate a positive reaction to the brucellosis test in relation to history of previous vaccination."

Observations on mastitis in an experimental herd, E. G. Hastings, B. A. Beach, and M. Johnson. (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 6, pp. 471–482*).—Three herds have been studied as to the incidence of *Streptococcus agalactiae* in the udders of their members and as to the incidence of mastitis as indicated by the composition of samples of foremilk of individual quarters. The complete freedom of two groups from *S. agalactiae* and the probable freedom of a third herd for over two lactation periods led the authors to believe that the establishment of herds free from this organism is not so impossible as some have indicated. "It seems possible to assemble groups of cows that will be free from *S. agalactiae* by purchase of heifers during the first gestation period or earlier. Trouble due to chronic mastitis in such groups will be relatively small in amount as measured by abnormalities in the quality of milk, in lessened production, and in loss of quarters."

Treatment of chronic mastitis during the dry period, O. W. Schalm. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 803, pp. 78–83, illus. 2*).—A study of the efficacy of chemotherapy for mastitis, administered during the dry period, was carried out in a herd of about 300 mature cows.

A 5 percent suspension of silver oxide in oil was found to be an efficient therapeutic agent for removal of *Streptococcus agalactiae* from the dry udder. Of 123 cows that were treated in all quarters while dry, and which freshened again during the period of study, 76 animals were cured by a single injection. However, only 41.4 percent of the cows treated between 1 and 30 days before calving were cured, while 80.6 percent of those treated between 31 and 60 days before freshening were freed of *S. agalactiae*. It is deemed advisable, therefore, to treat cows as early as possible in the dry period. A dry period of at least 8 weeks' duration is recommended so that sufficient time will be available to effect a cure. One mo. after silver oxide in oil has been introduced into an udder a sample should be drawn for bacteriological examination, and if *S. agalactiae* is still present a second treatment should be given.

It is cautioned that an injection of 5 percent silver oxide in oil into a dry udder is not without danger, as 3.8 percent of the quarters so treated became nonfunctional following occlusion of the teat by scar tissue resulting from excessive irritation. However, "the benefits derived from the use of silver oxide in oil during the dry period in a badly infected herd will far outweigh the losses incurred from irritation in isolated cases. . . . It is possible that the occurrence of teat strictures following the use of silver oxide can be overcome by injecting 10 cc. of mineral oil into each quarter after the therapeutic agent. This would help remove some of the silver oxide adhering to the teat wall so that it can be massaged up into the ventral portion of the quarter. This has been tried with 18 cows. The efficiency of the silver oxide in removing the infection was not lowered and no strictures developed. The number of animals is too small, however, for the results to be conclusive." Observations on milk and butterfat yields indicated that the injection of 5 percent silver oxide in oil into the dry udder did not, on an average, lower productivity.

Keratitis and its treatment with sulphanilamide, S. A. Khader (*Indian Vet. Jour., 20 (1943), No. 3, pp. 138–139*).—A corneal opacity in both eyes of a heifer calf disappeared completely after 3 days' treatment with sulfanilamide.

Salmonella enteritidis, var. dublin, infection in adult cattle, G. Bishop, W. Schatz, and A. S. Canham (*Jour. So. African Vet. Med. Assoc., 14 (1943), No.*

2, pp. 67–72).—Although of greatest importance in calves, outbreaks of paratyphoid are indicated in adult cattle. The incidence of paratyphoid abortions is believed to be greatest in primiparae.

Rape poisoning in cattle, F. T. Cote (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 2, pp. 38–41*).—Four distinct groups of symptoms—respiratory, digestive, nervous, and urinary—are noted, with descriptions and treatment suggested for each. The avoidance of pasturing any rape showing purple discoloration is emphasized.

Studies of sheep parasites.—I, The course of untreated nematode infections, P. A. Hawkins, C. L. Cole, E. E. Kline, and J. H. Drudge. (Mich. Expt. Sta.). (*Vet. Med., 39 (1944), No. 4, pp. 154–161, illus. 11*).—In a study with 50 ewes and their lambs, the course of naturally acquired untreated nematode infections was recorded, together with the accompanying egg counts, hemoglobins, red and white cell counts, and differential blood counts. During the winter months the parasite burden of the ewes dropped to a negligible quantity. In a few individuals complete eradication occurred. The ewes did not pick up any infection until the first warm weather in the spring, underwent self cure in the late spring after passing through a relatively low-grade infection, and maintained a very low level of infection for the remainder of the summer and fall pasture season. The lambs did not become heavily infected until 3 or 4 mo. of age. Clinical manifestations followed infection by 3 or 4 weeks. The lambs reached a peak in egg counts very rapidly; this was followed by a rapid decline. This rise and fall in egg counts was accompanied by inverse changes in hemoglobin and red blood cell determinations and by the appearance and partial disappearance of clinical symptoms.

The anthelmintic efficiency of phenothiazine in sheep (capsule, bolus, drench, and soybean pellets), W. M. Thorning, J. Sampson, and R. Graham. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 803, pp. 67–72, illus. 2*).—The experiment reported was an attempt to evaluate the anthelmintic efficiency of phenothiazine when prepared for administration in various ways. Five preparations of phenothiazine, (1) capsule, (2) bolus, (3) commercial aqueous colloidal suspension, (4) water-molasses suspension, and (5) soybean feed pellets containing phenothiazine, were compared on the basis of post-treatment reduction of parasitic ova in the feces as determined by periodic fecal examinations of 60 treated and control lambs, together with hemoglobin determinations, gain in weight, and clinical appearance of the lambs during the experimental period.

No significant difference between the treated groups was observed. *Haemonchus* spp. and *Oesophagostomum* spp. infestations were lowered, while *Strongyloides*, *Trichuris*, and *Nematodirus* were not appreciably affected. Further evidence that phenothiazine is beneficial in the treatment of lambs infested with internal parasites was shown by more rapid gain in weight and general improvement in health of treated lambs as contrasted with untreated lambs. It was demonstrated that phenothiazine can be successfully administered to sheep when incorporated in a pellet made from soybean-oil meal.

A method for preventing the development of strongylid eggs in sheep faeces during transport and storage, H. V. Whitlock (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *16 (1943). No. 4, pp. 215–216*).—The method described utilizes the vapor of orthodichlorobenzene. Egg counts by the dilution-flotation technic can be carried out with samples so treated.

Recent advances in connection with swayback in lambs, with allied disorders in man and animals, and experimental demyelination diseases, J. R. M. Innes (*Vet. Rec., 55 (1943), No. 41, pp. 369–372*).—This review deals

with investigations of swayback in England, allied demyelinating disorders in man and animals, enzootic ataxia or swayback in Australia, "renguera" (swayback) in Peru, experimental demyelination diseases, and the need for further experimentation.

Pathogenic organisms complicating haemorrhagic septicaemia in swine, C. E. Phillips (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 2, pp. 35–37*).—Preliminary experiments carried on to establish the value of early serum immunization, followed by inoculation with a bacterin at a suitable age, have resulted in identifying *Pasteurella suiseptica* and *Alcaligenes bronchisepticus.* Encouraging results were obtained with a preventive administration of 1 cc. of *A. bronchisepticus* and 1 cc. of hemorrhagic septicemia serum per pound of body weight within 48 hr. of birth, followed by a bacterin containing these organisms at approximately 3 and 4 weeks of age.

Immunization against swine pox, H. C. Smith, E. E. Harnden, O. S. Willham, and C. S. Hobbs. (Okla. Expt. Sta.). (*Vet. Med., 39 (1944), No. 4, pp. 167–169, illus. 1*).—In a vaccination program using swine pox virus, 122 out of 226 pigs were vaccinated at from 26 to 81 days of age. There were 15 cases of pox among these pigs and 16 cases among the 104 pigs which were not vaccinated. In a group of 64 pigs, 35 were vaccinated, of which 4 contracted pox, as compared with 11 cases among the 29 controls. "While the records do not show significant differences, observations indicate that the vaccinations lessened the severity of the pox and maybe prevented some of the more serious complications."

A high percentage of deaths in 5 litters of pigs vaccinated for hog cholera while affected with swine pox is attributed to the combined effect of the two viruses.

The effects of various intravenous injections on the horse, S. J. Roberts (*Vet. Jour., 99 (1943), No. 12, pp. 314–316*).—Conclusions based on over 200 intravenous injections with 20 separate materials and 69 horses are briefly summarized.

Förgiftning hos häst i anslutning till lavemang med ättiksyralösning (Poisoning of horses in connection with lavage with a solution of acetic acid), A. Johannsen (*Skand. Vet. Tidskr., 33 (1943), No. 11, pp. 659–677; Eng. abs., pp. 675–676*).—In connection with an account of four cases of poisoning in horses occasioned by lavage with a 2.5-percent solution of acetic acid, the author discusses the general effect of acetic acid on the organism when administered in various ways and doses.

Equine abortion, M. W. Henning, J. J. Keppel, and C. H. Flight (*Jour. So. African Vet. Med. Assoc., 14 (1943), No. 2, pp. 59–66*).—An outbreak of infectious abortion in several mares is described for the first time from South Africa. "The infection apparently made its appearance like a bolt from the blue, and its source has remained obscure."

Treatment of canine coccidiosis, B. S. Parkin (*Jour. So. African Vet. Med. Assoc., 14 (1943), No. 2, pp. 73–76; also in Vet. Med., 39 (1944), No. 2, pp. 59–61, illus. 2*).—Following tests of various remedies, a routine treatment was devised of 10 cc. of a 1-percent solution of sodium sulfanilyl sulfanilate per kilogram of body weight, given as an enema and repeated in 24 hr. A single case of coccidiosis in a cat was also successfully treated on the same proportional weight basis.

A new treatment for scabies in a dog, J. L. Davidson (*Vet. Med., 39 (1944), No. 4, pp. 174–175, illus. 1*).—Use of a solution of approximately 33 percent benzyl benzoate is advocated.

Distemper studies in foxes.—VII, The association of lymphocytic choriomeningitis and ferret distemper viruses in experimental fox distemper,

L. M. Heath (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 2, pp. 42–47*).—Continuing this series (E. S. R., 90, p. 831), supernatants of spleen tissue suspensions derived from foxes which presumably died of canine distemper as a result of inoculation with virus contained in puppy spleen indicated by pathogenicity tests in ferrets, guinea pigs, and mice that the supernatants contained the virus of lymphocytic choriomeningitis either as an entity or in combination with ferret distemper virus. The distemper virus was only present in those supernatants originating from foxes which had manifested symptoms in excess of 5 days before death intervened. One fox which became infected as a result of contact exposure manifested symptoms of distemper for 12 days before death, but in the supernatant derived from its spleen only the virus of ferret distemper was demonstrated in comparative pathogenicity tests. Neither the viruses of lymphocytic choriomeningitis nor of ferret distemper after purification by successive passages in guinea pigs and ferrets, respectively, were capable of causing disease in healthy nonimmune foxes aged 8 mo., either as entities or in combination. If age was not a factor in these results, the possibility is suggested that the pathogenic agent which produced death in the foxes exposed to the virus in puppy spleen may have been an unrecognized virus pathogenic for foxes and dogs but not for ferrets, guinea pigs, and mice.

Aktive Immunisierung mit Hühnerembryo-Impfstoffen gegen die zur Zeit in Deutschland auftretende atypische Geflügelpest [Active immunization with chicken-embryo vaccine against the appearance in Germany of an atypical fowl cholera], E. Traub (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 150 (1943), No. 1–2, pp. 1–16*).—Precautionary measures to combat a threatened spread of a disease encountered since 1941 are discussed. The disease differed in several ways from the classical fowl cholera. Tests of various vaccines are reported.

Feeding habits in relation to the severity of cecal coccidiosis, Eimeria tenella, S. A. Edgar and C. A. Herrick. (Wis. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 1, pp. 30–35*).—Results of 11 experiments testing the susceptibility of chickens to coccidiosis when they had access to feed at all times or were not fed until after 7 a. m. central standard time are reported. In every instance the chickens that had continuous access to feed were more resistant to coccidiosis. The ratio of deaths between the on-feed and off-feed groups, when all laboratory chickens were considered, was 1:2.78. The ratio of deaths for the chicks kept under range conditions was 1:8.1 for the first 14 days and 1:2.26 later. It is concluded that the presence of feed in the digestive tract of birds at the time oocysts are received makes them more resistant to infection. The difference in susceptibility is believed to be sufficiently great to justify the keeping of feed before chickens at all times.

Pulorose [Pullorum disease], A. G. de Azevedo (*Bol. Min. Agr. [Brazil], 32 (1943), No. 1, pp. 59–65, illus. 3*).—The disease is described and remedies are discussed.

Absence of breed differences in bactericidal power of blood plasma of chickens over Salmonella pullorum, J. R. Carson and R. K. Cole. (Cornell Univ.). (*Poultry Sci., 23 (1944), No. 1, pp. 43–48*).—Pedigreed chicks from pullorum-free hens representative of the White Leghorn and New Hampshire breeds were tested for a 5-day period after hatching to determine the bactericidal power of their blood plasma against a strain of *S. pullorum* isolated from the ovary of a White Leghorn pullet. No differences between the two breeds in this respect were found. The bactericidal power of the blood did not increase during the first 5 days after hatching as does resistance to pullorum disease. Thirty White Leghorn females and 30 New Hampshire females were picked at

random with no knowledge of their resistance to pullorum, and these adults also showed no difference between the breeds in bactericidal power of the plasma. It is concluded that the difference in resistance to *S. pullorum* infection between White Leghorns and New Hampshires is not necessarily accompanied by a corresponding difference in the bactericidal activity of their blood plasma.

A review of psittacosis in domestic birds, with a note on a case of conjunctivitis in a pigeon probably due to psittacosis, J. D. W. A. Coles (*Jour. So. African Vet. Med. Assoc., 14 (1943), No. 2, pp. 47–58, illus. 9*).—Continuing a previous discussion (E. S. R., 86, p. 382), the literature pertaining to psittacosis in domestic birds, such as the pigeon and fowl, has been reviewed. The importance to public health of these new strains of the virus has been emphasized. A case of conjunctivitis in a military pigeon, probably of psittacotic origin, has been described.

AGRICULTURAL ENGINEERING

The water facilities program in the war effort, H. F. McColly. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 2, pp. 43–44, illus. 1*).—This paper outlines the work carried on by the U. S. D. A. Farm Security Administration under the Water Facilities Act of 1937 (amended 1940).

The program includes only those types of water facilities which make it possible for farmers and ranchers to store or utilize water for livestock, crop and hay lands, ranges and pastures, farm gardens, domestic water, and other agricultural purposes. Assistance is offered in constructing, installing, repairing, and keeping in use the following kinds of facilities: (1) Ponds and reservoirs; (2) stock water tanks and dugouts; (3) spring developments; (4) wells and pump and windmill installations; (5) facilities for recharging underground reservoirs; (6) farmstead water and farm garden irrigation; (7) detention, retention, and diversion dams; (8) water spreaders, and (9) conduits, irrigation facilities, and farm distribution systems.

Sedimentation in reservoirs, B. J. Witzig (*Amer. Soc. Civ. Engin. Proc., 69 (1943), No. 6, pp. 793–815, illus. 3*).—The author notes that to a great extent the evaluation of the sediment problem on a particular watershed remains a qualitative one, the accuracy of available methods of analysis being compared with that for the more rigidly established branches of hydrology. The general aspects of the principal phases of reservoir sedimentation are reviewed, and the present status of knowledge and investigation is summarized. Recent developments attempt, with some success, to combine the empirical and rational procedures, but their present complexity warrants retaining those empirical procedures which have been successfully used.

The author holds that additional data should indicate the possibility of developing accurate "regional indexes" that may be applied to proposed reservoirs. Although present methods of collecting data give a reasonable accuracy considering the highly variable factors involved, the most practical and accurate methods of measurement and analysis should be evolved. The required research and the collection of data are expensive and slow, but it is doubted that total research costs to date exceed a small percentage of the value of irreplaceable reservoir storage capacity already destroyed.

Of the problems of suspended load, bed load, sediment trap efficiency, etc., some mathematical discussion is presented.

Water willows for shoreline erosion control in farm ponds, H. J. Harper. (Okla. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv., 9 (1944), No. 9, pp. 212–213, illus. 1*).—The water willow, a herbaceous perennial with willowlike leaves

and a pithy stem, was found useful in Oklahoma for protecting the banks of large farm ponds from wave damage. Since the plant does not grow in water much over 2 ft. in depth, it does not clog ponds as do certain aquatic plants.

Building terraces with the moldboard plow, R. C. SHIPMAN and R. O. COLE. (Purdue Univ.). (*Agr. Engin., 25 (1944), No. 1, pp. 15–16, illus. 4*).—The authors find the plow method of construction of terraces simple, efficient, and giving a satisfactory type of terrace. The moisture condition of the soil should be satisfactory for good plowing, however, and excess trash should be removed or processed before the terrace building is begun. Other types of equipment should be used where erosion has progressed to an advanced stage and on slopes that exceed 6 to 8 percent. The disk plow works better than does the moldboard type in dry soil and trash.

Blitzing the brush in Florida, J. E. WILLIAMS (*U. S. Dept. Agr., Soil Conserv., 9 (1944), No. 9, pp. 208, 213, illus. 2*).—The largest of the brush-cutting machines described comprises two units, each 7 ft. wide and weighing 4,500 lb. The cutting unit of the machine is a hollow steel drum around which are bolted blades attached much as are those of the stalk cutter. The drum is filled with water, which approximately doubles the weight and brings a 2-unit machine of this size to a total weight of 18,000 lb. Maximum cutting ability is obtained through hitching the 2 units in tandem, with a semirigid connecting link forcing the rear unit to follow the first at an oblique angle. Operated in this way this large machine very effectively cuts brush, palmetto, bay, and small oak and pine. The action is said to be such that the rubbish is cut into the soil without inversion, leaving the topsoil in place and in a condition such that grass seed can be planted without further operations.

This largest machine requires considerable power. Crawler-type tractors of the medium range of horsepower are sufficient, however. A slightly smaller machine, having units of 5-ft. spread, is handled easily by lighter tractors.

New farm machinery developments needed. (*Agr. Engin., 25 (1944), No. 2, pp. 39–42, illus. 2*).—A symposium with papers by A. P. Yerkes, E. G. McKibben (Mich. State Col.), and E. J. Baker, Jr.

In the paper by McKibben (pp. 40–41), first among the important desiderata listed is a complete line of field machines which would operate in their own path and turn in their own length. This would solve most of the machine problems resulting from small irregular fields and such soil conservation practices as contour farming and strip cropping. Such machines will be increasingly needed as the mechanization of agriculture is pushed into less favorable areas and soil conservation practices gain wider acceptance. Also much to be desired are a tractor mower that will mow to the side under the low-hanging limbs of trees and also mow the narrow strip between the ends of the limbs of adjacent rows of large trees; a tractor which would be primarily a chassis for mounting such harvesting machines as balers, forage harvesters, combines, and various types of corn harvesting equipment; an independent friction clutch for the power take-off; lighter, more reliable, small gasoline engines; mounted machines which may be removed in the minimum number of pieces, and with no small detached parts to be lost between seasons; mulch culture equipment to give better weed control in humid sections; corrosion-resistant tillage elements, such as plow bottoms, cultivator shovels, etc., which scour satisfactorily; a sugar-beet planter which will place a single seed within one-half inch in either direction from the ideal location in the row; complete supplementary irrigation systems, including tractor, pump, portable pipe, nozzles, and engineering service; power-operated pruning shears or saw; beet and potato harvesters which will separate potatoes or topped sugar beets from stones and clods; equipment to put corn in the crib

or bin and dry chopped cornstalks in the mow without excessive labor; a manure loader that would meet the needs of the average owner of a manure spreader; and electrically driven conveying and elevating equipment. Once-a-season lubrication is also needed as some two-row corn pickers have over 100 grease-gun connections and a beet harvester may have as many. The proper lubrication of such a machine takes about 10 percent of the operator's time.

Interchangeable power units for farm machines, F. W. Duffee. (Univ. Wis.). (*Agr. Engin., 25 (1944), No. 2, pp. 45, 47, illus. 1*).—The author presents the case for light-weight engines made transferable from one machine to another by standard size mounting brackets and power couplings. Among his reasons for suggesting such a universal engine are the facts that (1) the power take-off drive is not entirely satisfactory for some field machines, particularly under adverse conditions; (2) a considerable number of machines are now equipped with auxiliary engines; (3) there is a large inventory of belt-driven machines; (4) an increasing number of machines can profitably be equipped with auxiliary engines; and (5) there is an increasing popular demand for auxiliary engines on combines and some other field machines. The question might be asked, "Why wear out the engine of a $1,000 tractor to do belt work when a $300 engine will do the job?"

Each engine, regardless of crankshaft speed, can be equipped with a gear box designed for that particular engine providing power take-off speed at the stub shaft. This assembly goes with the engine and should fit any machine. If such a standardization program is carried out, the author would expect future engine developments in this field to take the form of light-weight construction; either air-cooled or water-cooled engines with magnesium blocks and crankcases, aluminum heads, and pressed steel oil pans and flywheel housings.

Uses for multicylinder engine on a dairy farm, A. J. Schwantes. (Univ. Minn.). (*Agr. Engin., 25 (1944), No. 2, pp. 46–47, illus. 1*).—With the purchase of a combine or a pick-up baler, the farmer frequently gets an auxiliary engine to drive the working parts of the machine. If the machine is used entirely or nearly so on one farm only, and if the farm is of average size, the number of hours of annual use is not large. This paper deals with the possible uses of a multicylinder internal-combustion engine of about 20 hp. on a general farm where dairying is the major enterprise. The cost analysis for the use of a 20-hp. stationary engine under the conditions set forth in this discussion is shown. It was necessary to estimate the value of some of the factors, but care was taken not to show a cost too low for a reasonable annual use. The overhead cost was only 10 ct. per hour in comparison with 25 ct. per hour for operating costs. Hence, increasing moderately the annual use would not appreciably affect the total cost per hour.

Present status of the plow as a tillage implement, R. A. Norton, E. V. Collins, and G. M. Browning. (Iowa Expt. Sta. Coop. U. S. D. A.). (*Agr. Engin., 25 (1944), No. 1, pp. 7–10, illus. 9*).—Differences in corn yield brought about by various cultural treatments were unimportant on Clarion soils when the previous crop was corn. Greater benefits were obtained from sweetclover when plowed under than when it was retained on the surface by subsurface tillage. On the Webster silty clay loam soil the yields from plats that were plowed were consistently higher than those from subsurface-tilled areas. When crop residues were removed from the land before plowing and replaced after plowing, corn yields were as good as or better than those obtained where residues were plowed under. An exception to this was noted in the test on the second-year corn on the Webster silty clay loam in 1943. Yields were consistently higher on hard-ground listed areas than on subsurface-tilled areas

on terraced land on the Marshall silt loam soil. Corn plants on plowed plats on Clarion and Webster soils were significantly taller than those on subsurface-tilled plats. Contour-listed corn was nearly equal to plowed and surface-planted corn on Clarion loam in spite of a 9-percent reduction in average stand. On a soybean field, areas which had been prepared for the previous crop by the subsurface cultivator and subsoil lister were freer from weeds, the crop matured earlier, and yields were significantly larger than on areas which had been prepared for the previous crop by plowing residues under.

By using mulch culture implements rather than the plow for primary seedbed preparation, it has been possible to reduce power and labor requirements for seedbed preparation and planting by one-third to one-half. Some of the problems that may be met in studies of cultural treatments are indicated.

Performance of irrigation sprinkler units, L. H. SCHOENLEBER. (Kans. State Col.). (*Agr. Engin., 25 (1944), No. 2, pp. 49–51, illus. 5*).—Several types of sprinklers were tested to determine their characteristics and adaptability when operated with electrically powered water systems. The sprinkler units under observation in these tests were (1) perforated pipe (3-in. diameter), (2) a floating rotary spray having eight $\frac{3}{32}$-in. holes, (3) a rotary spray (single action; $\frac{1}{8}$-, $\frac{5}{32}$-, $\frac{3}{16}$-, and $\frac{7}{32}$-in. nozzles), and (4) an oscillating lawn sprinkler (13 large or 13 small nozzles). Water was supplied to sprinklers by an electrically powered water system, equipped with 20-gal. pressure tank and shallow well turbine pump and driven by a directly connected ½-hp. electric motor. The pump had a normal capacity of 395 gal. per hour for low heads. The water level below the pump was 2½ ft.

The discharge capacity for each sprinkler unit was determined for the lowest pressure under which it would operate, for the maximum pressure obtainable, and for each 5 lb. per square inch pressure between the maximum and minimum limits. The quantity of water discharged, area covered, and the uniformity coefficient for sprinklers operating at different pressures are shown. Soil moisture cans were placed on 2-ft. squares on all sides of the sprinkler, and the water collected during each test was measured to the nearest cubic centimeter. It was apparent from the water collected in each can that the amount varied greatly over the area covered by each sprinkler. The quantity varied greatly over the area covered by each sprinkler. To compare the uniformity of distribution of the water of one sprinkler with that of another, a "uniformity coefficient" was determined. This coefficient, expressed as a percentage, is defined by $C_u=100\ (1-\Sigma d/m\ n)$, in which C_u is the uniformity coefficient, d is the deviation of individual observations from the mean m, and n is the number of observations.

With respect to the pressure and rate of discharge, it is noted that the perforated pipe with either one or two 10-ft. sections and the floating rotary spray would operate with pressures as low as 2½ to 5 p. s i. All other units required 10 p. s. i. pressure to operate them. All sprinklers except the floating rotary spray unit discharged more water with increased pressure. This sprinkler was so designed as to discharge very nearly the same quantity of water regardless of pressure. There was a maximum difference in discharge for this sprinkler of only about 50 g. p. h. between pressures of 10 and 45 p. s. i. All units tested where different-sized nozzles were used showed that in every case the unit having the larger nozzle discharged more water at the same pressure.

The area over which water was distributed for given pressures was greatest with the smallest nozzle on the rotary spray unit. Most sprinkler units equipped with the smaller nozzles would water a larger area for one sprinkler setting. This did not always hold true for the oscillating lawn sprinkler, however. This sprinkler ranked second in maximum area covered at various

pressures, and the perforated pipe ranked third. The area covered by the floating rotary spray sprinkler showed less variation and ranked last of all units tested. The time required to apply 1 in. of water to an area covered by one sprinkler setting was lower for the lowest and higher pressures. In most cases the time required to apply 1 in. of water was the greatest for some pressure between the maximum and minimum pressure. The least time was needed to apply 1 in. of water to the area covered through the floating rotary spray unit. The perforated pipe ranked next, and the rotary spray unit using ⅛-in. nozzles required the most time. When an equal quantity of water was applied on a unit-sized area with different sprinklers, indications were that the least time was required, for the same pressure, by the two sections of 10-ft. perforated pipe, floating rotary spray ranked second, one 10-ft. section of perforated pipe ranked third, and the rotary spray ranked fourth (7/32-, 3/16-, and 5/16-in. nozzles). The oscillating lawn sprinkler with the large nozzle ranked last. The variation in time at a given pressure varied as much as from 200 to 300 percent for different systems. The oscillating sprinkler equipped with small nozzles showed the highest consistent uniformity coefficient, the value varying from 45.5 to 51.8 when operating at various pressures. The highest uniformity coefficient obtained was 63.1 with the oscillating sprinkler equipped with large nozzles operating at 25 p. s. i. pressure. The floating rotary spray and rotary spray, ⅛-in. nozzle, showed the lowest uniformity coefficient and the greatest variation, or 13.1 to 31.9 and 4.0 to 45.0, respectively, for different pressures. The perforated pipe operated at different pressures also showed the uniformity coefficient varying widely.

Construction and operation of the summer egg cooler, C. A. Roberts and H. D. Polk. (*Mississippi Sta. Bul. 388 (1943), pp. 11, illus. 2*).—Somewhat fuller construction directions are included with essentially the same information already noted (E. S. R., 89, p. 493).

Wartime problems in farm building construction, J. W. Simons. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 1, pp. 13–14, 16*).—This article consists mainly of an analysis of recent restrictive and permissive orders issued by the War Production Board. Copper (for wiring) and steel have recently become less scarce. Expenditure limitations on dwelling construction have been raised. Lumber remains rather difficult to obtain, but the situation was somewhat improved in December 1943.

The 1944 farm building goals, C. L. Hamilton. (U. S. D. A.). *Agr. Engin., 25 (1944), No. 1, pp. 17, 20*).—The author of this discussion predicts that while food production in 1944 will be at a record high, the total volume of farm construction will probably not exceed more than about one-half of the amount constructed in 1929 or 1941, or of what might be expected with good crops and prices and normal building conditions. With higher price levels for labor and materials, the amount of construction in comparison to expenditures will be less than during normal times. Except for essential replacement, new construction should be considered only as the last resort. As much, if not greater, resourcefulness and skill will be required to develop and guide this wartime program than would be required for a program of new construction.

Coordination of the dimensions of building materials and equipment, J. A. Ruhling (*Agr. Engin., 25 (1944), No. 2, pp. 54–55, illus. 3*).—A study project of the American Standards Association is outlined. The use of the 4-in. module is discussed and illustrated, with special reference to concrete block construction.

Silo drainage stops a nuisance, C. G. Snyder (*Minn. Farm and Home Sci. [Minnesota Sta], 1 (1944), No. 2, p. 10, illus. 2*).—A gravel fill 20 in. deep on

the silo floor was used in conjunction with either (1) a 4- by 4-in. trough extending across the full diameter of the silo and covered with loosely fitted concrete slabs or (2) a double line of hexagonal tile also extending across the entire diameter of the floor. The author's experiments led to the conclusion that drains can be effectively used to eliminate the disagreeable odor, unsightliness, and structural damage caused by leaky silos.

The volume of drainage showed a marked variation for three fillings of alfalfa and increased with the increase in moisture content of the ensiled material. Although the total volume of the juice increased only 4.2 times, the maximum rate of flow was 6.6 times as great at 77 percent moisture as at 72 percent, the digestible-protein losses increased 2.8 times, and the mineral loss 2.7 times.

The Iowa rural fire prevention program, H. GIESE. (*Iowa State Col.*). (*Agr. Engin., 25 (1944), No. 1, pp. 19–20*).—In the period from 1930 to 1942, during which special measures for the discovery and removal of rural fire hazards have been instituted and extended, rural fires were reduced from 2,666 to only 951 (64.4 percent). During the same period urban fires dropped from 4,321 in 1930 to 2,915 in 1942 (37.5 percent). As one of the newer preventive measures a superintendent of public instruction requested that all rural school teachers give fire prevention instruction during Fire Prevention Week and ask pupils to take fire hazard check sheets home during the week for checking farm and home buildings. The same author has published a previous report on the Iowa fire prevention program (E. S. R., 87, p. 582).

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Maine Station] (*Maine Sta. Bul. 420 (1943), pp. 460–464, 483–495, 500, 505–510, 513–514, 546–548, 571–574*).—In addition to results previously noted, some findings are included on the following investigations: (1) A study of the practices and production costs of potatoes on 178 farms in central Aroostook County in 1940 and 172 farms in the southern part of the county in 1941; (2) a study of transportation and allied problems in marketing potatoes under wartime conditions based on information regarding the 1942 crop obtained from 323 potato growers; (3) a study of country milk-assembling plants dealing with the trends in numbers of plants, volume of milk handled, methods of collection, possibilities of reorganizing collection routes to reduce transportation, etc.; (4) a study of the feasibility of every-other-day deliveries of milk based on interviews with 966 families in the Portland market; (5) a study of milk distribution through stores in the Portland market based on 966 consumers and 348 stores during the summer of 1942; (6) studies of the quality and weight of eggs sold in Portland and of the seasonal variations in eggs set and hatchability of eggs by breeds; (7) a study, in cooperation with the U. S. Department of Agriculture, of the production and labor requirements of peas for processing; (8) land classification of lands in Penobscot and York Counties; and (9) a study of agricultural prices and price relationships which includes a table making monthly comparisons of the index of Maine farm prices during the First and Second World Wars.

Current Farm Economics, [February 1944] (*Cur. Farm Econ. [Oklahoma Sta.], 17 (1944), No. 1, pp. 32*).—Included, in addition to the usual review of the agricultural situation and the tables of prices, indexes of prices, and indexes of purchasing power of Oklahoma farm products, etc., are the following articles: Wartime Farm Income—A Challenge for Sound Management, by G. P. Collins (pp. 8–14); American Agriculture at War, by D. L. W. Anker (pp. 15–19); and Sale of Livestock by Oklahoma Farmers, by A. L. Larson (pp. 20–24), with

tables showing sales through different types of outlets, sales of slaughter animals by outlets by number sold per farm, and frequency distribution of average number of head per sale by farmers.

Arizona agriculture, 1944: Production, income, and costs, G. W. Barr (*Arizona Sta. Bul. 192 (1944), pp. 18+, illus. 7*).—This annual statement (E. S. R., 90, p. 118) discusses the production and cost of and income from different crops, kinds of livestock, and livestock products in 1943 and makes comparisons with 1942 and the averages for different periods. Land prices, the labor problem, and farm debt reduction are also briefly discussed. A map shows the location of about 95 percent of the irrigated area and most of the citrus areas in the State.

Maine agriculture in 1940: A statistical presentation, C. H. Merchant (*Maine Sta. Misc. Pub. 578 (1943), pp. 257+, illus. 42*).—Maps and tables present data from the 1940 U. S. Census of Agriculture by counties and minor civil divisions covering the number and acreage of farms; the value of real estate and personal property; number and production of different kinds of livestock, including poultry; acreage and production of different field crops, fruits, vegetables, etc.; farm expenses—labor, feed, implements and machinery, gasoline and oil, building materials, fertilizers, etc.; farm motive power—automobiles, trucks, and tractors; electricity and telephone service; etc.

Wartime production problems of Pennsylvania farmers: An analysis with special attention to the feed situation, W. E. Keepper and M. S. Parsons. (Coop. U. S. D. A.). (*Pennsylvania Sta., Jour. Ser. Paper 1218 (1944), pp. 40+*).—Personal visits were made in October 1943 to 190 farmers in 8 counties of the State, selected to represent the dairy, livestock, and general farming areas and who had been included in a larger study in 1942 to ascertain the labor situation.

The changes in the numbers of livestock, acreages of crops, and over-all production from 1942 to 1943; production problems (feed, labor, machinery, and other problems); and the possibilities of further increases in wartime production are discussed.

Foreign Agriculture, [February and March 1944] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 8 (1944), Nos. 2, pp. 25–48, illus. 1; 3, pp. 49–72, illus. 1*).—An article in No. 2 by A. I. Tannous (pp. 27–42), Agricultural Production and Food Consumption in Iran, describes the geographic features, the population, the rural community, systems of land tenure, crop-production methods, processing and milling facilities, the principal crops and agricultural products, food consumption, and forests. Another article, Food in Germany, by J. H. Richter (pp. 43–48), discusses the German food economics in 1939 as contrasted with the situation in 1914, consumption in 1942–43 and 1943–44, and the outlook for 1944–45. Tables show the estimated food rations and consumption allowances in Germany, by food constituents and calories, according to indicated consumer categories, 1942–43 and 1943–44.

Included in No. 3 are an article, Agricultural Resources of South Africa, by M. E. Wright (pp. 51–62), discussing the position of agriculture in South Africa's economy, the climate, soils, rural population, pattern of agricultural production and trade, wartime production trends, the commodity-supply position, and the conservation of agricultural resources; and an article, The New Flax Industry of Peru, by E. P. Tappy (pp. 63–72), describing the development of the flax industry in Peru and government aid and regulations.

World wheat survey and outlook, January 1944, H. C. Farnsworth and M. A. Clough (*Wheat Studies, Food Res. Inst. [Stanford Univ], 20 (1944), No. 3, pp. 97–136+, illus. 9*).—"World" wheat supplies for the crop year 1943 were perhaps 800 million bu. larger than the huge supplies of 1938–39, which had

added over 500 million bu. to the world carry-over. This year, however, the utilization of wheat has so far exceeded earlier levels that year-end stocks are expected to be sharply reduced. The amount of wheat recently diverted to feed and alcohol production in this country has substantially exceeded the quantity milled for flour. Soviet Russia apparently has smaller supplies of bread grain this year to meet increased deficits in areas liberated from German control. Russian wheat imports from North America, though sizable, will presumably not be sufficient to offset the enlarged deficit.

What's ahead in farm production, prices, and costs? (Graphic presentation), K. T WRIGHT and E. F. REBMAN (*Michigan Sta., 1944, F. M. 341, pp. 30+, illus. 29*).—Tables covering farm production, prices of land and agricultural products, costs, etc., are included and discussed under the headings: Will history repeat itself, what adjustments are needed in crops and livestock, what about feed and livestock price relationships, what's ahead with respect to farm prices, and will farm costs continue to rise.

Post-war planning by individual farmers, R. L. ADAMS (*California Sta., [1944], pp. 4*).—"This publication will note a number of ways in which farmers may prepare themselves to withstand a recession in prices, and hence in incomes, after the war; these include (1) reducing operating expenses; (2) improving yields, (3) diversifying, (4) changing the size of the farm, (5) reducing debts, and (6) producing family foods."

Some trends in the farm real estate situation, H. R. MOORE (*Ohio Sta. Bimo. Bul. 226 (1944), pp. 74–76*).—Using tables from Darke, Madison, and Muskingum Counties, tables are included and discussed showing for 1941 and 1942 and the first 9 mo. of 1943 the numbers and percentages of farms sold by active farmers, retired farmers or widows, estates, nonfarmers, and corporations; the purchases by owner-operators, tenants, and nonfarmers; and the mortgage debt commitments of the buyers.

The influence of mineral rights on transfers of farm real estate in Oklahoma, E. D. DAVIDSON and L. A. PARCHER. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul. 278 (1944), pp. 16*).—The land transfers in eight typical counties were studied. The study was based on experiences of buyers and sellers of farm lands and information obtained from real estate dealers, abstractors, etc. It discusses "some of the complications that may result when the mineral rights on a piece of land are separated from the fee-simple estate, and which need to be considered when buying farm real estate under existing conditions in Oklahoma."

Agricultural credit, J. M. MCNEILL (*U. S. Dept. Agr., Libr. List 7 (1944), pp. 41*).—Included are 341 publications of the Federal Government and 98 of the State agricultural colleges and experiment stations issued from 1929 to 1943.

Farm terracing costs, P. NELSON and E. A. TUCKER. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul. 276 (1944), pp. 8, illus. 2*).—A table based on the experiences of 23 Muskogee and 76 Kiowa County farmers is included and discussed. It shows the labor and power used per mile; the cost per mile for farm labor, hired labor, horse work, and tractor power; cash cost and total costs for different types of power used and heights and widths of terraces for each county.

Reducing mileage in farm transportation, A. A. DOWELL and S. B. CLELAND (*Minnesota Sta. Bul. 373 (1943), pp. 28, illus. 9*).—The principal objectives in this study were "(1) to ascertain the number, age, type, and condition of motor vehicles on farms in a typical southwestern Minnesota county, (2) to determine the on-farm and off-farm use of these vehicles during a specified period of time, (3) to ascertain the extent of cooperation among farmers in the use of farm-owned motor vehicles, (4) to determine the extent to which commercial trucks are used by these farmers or are readily available to them, and (5) to suggest ways and means for reducing farm transportation mileage."

Data covering August 2–8, 1942, were obtained from 493 farmers in Martin County, who reported 509 automobiles, 111 standard trucks, 89 pick-up trucks, and 209 auto trailers. The age of the motor vehicles, condition of tires, miles driven and frequency of use, nature and number of trips off the farm, products sold and supplies bought, methods of hauling such commodities, cooperation with neighbors, number of commercial trucks hauling farm products and supplies, etc., are analyzed and discussed. The bringing about of greater efficiency in farm transportation and hauling through better planning of trips, greater cooperation with neighbors, and greater use of commercial trucks is discussed.

Farm management problems in soil conservation planning, H. O. Anderson and D. R. Mitchell (*U. S. Dept. Agr., Soil Conserv. Serv., 1943, pp. 40+, illus. 6*).—A handbook of farm management and phases of soil conservation planning for soil conservation trainees.

Farm management analysis of 107 farms on the Cumberland Plateau, E. J. Lebrun (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 165 (1944), pp. 30+, illus. 10*).—The data from 107 farm account books kept under supervision of the University of Tennessee Agricultural Extension Service are summarized and comparisons made with census data for all farms in the 10 plateau counties. The data in both cases are for 1939.

Incomes, costs, and practices on three types of farms producing potatoes in central Maine, 1938, W. E. Schrumpf (*Maine Sta. Bul. 422 (1943), pp. 29–103+, illus. 1*).—This bulletin is based on information obtained from the operation of three types of farms producing potatoes in the area. Of 146 farms, 79 were potato farms (chief source of income and 40 percent or more of cash receipts from potatoes), 36 livestock farms (chief source of income and 40 percent or more of cash receipts from livestock products), and 31 general farms (less than 40 percent of cash receipts from either potatoes or livestock).

The data are analyzed to show and compare by type of farm the farm capital, receipts, expenses, and net income; farm acreage; crops produced; livestock kept; etc. Analysis is also made of the costs, labor requirements, equipment used, materials used, etc., in producing, harvesting, storing, and selling potatoes, and the receipts and returns from the potato enterprise on each type of farm. Comparisons are made of the size of business, yield rates, labor efficiency, capital efficiency, farm balance, nad the potato enterprise on the different types of farms. A comparison is made of selected farms having higher-than-average yield rates, 10 or more productive-animal units, and 10 or more acres of potatoes, with the averages for the three types of farms.

The average labor incomes were —$146 for potato farms, $541 for livestock farms, and $296 for general farms. Average returns on capital were —$709, —$11, and —$317, respectively. The average net return per acre for potatoes was —$3.09 on the potato farms, —$45.62 on the livestock farms, and —$19.32 on the general farms. The cost of producing and marketing potatoes per barrel averaged $1.36 on the potato farms, $1.74 on the livestock farms, and $1.54 on the general farms. About 71 percent of the cost was for growing, 9 for harvesting, 18 for storage, and 2 percent for selling. Of the growing costs, about one-third was for labor, power, and equipment; two-fifths for fertilizer; one-tenth for seed; and the remainder for spray and dust materials and indirect costs.

The comparison of the selected farms with the averages for the three types of farms indicated "that a more efficient livestock enterprise would increase the income on potato farms, and that a more efficient potato enterprise would increase the incomes on the livestock and general farms. Labor earnings on the selected farms averaged $1,850 per farm, which is $833 per farm more than the average of the livestock farms, $1,072 more than the general farms, and $1,523 more than the potato farms."

Costs and practices in producing potatoes in central Aroostook County, Maine, 1940, W. E. Schrumpf (*Maine Sta. Bul. 424 (1943), pp. 133–170+, illus. 3*).—The purpose of this study was "to give a description of the farms including crops, livestock, and tractive power; to show (1) the application and the cost to the farmer of labor, tractive power, and equipment for the various operations in potato production, (2) the amount and cost of materials, and (3) the indirect costs; and to indicate the factors affecting the costs."

The data were obtained by the survey method for 178 farms concerning the costs and practices in growing, harvesting, storing, and selling the 1940 crop of potatoes. Analysis is made of acreages in farms, acreage in different crops, numbers and kinds of livestock, tractive power, etc.

The average size of farm was 191.4 acres, of which 119 acres were in cropland and 46.7 in potatoes. The average cost of producing and marketing potatoes was $139.25 per acre or $1.127 per barrel. Of the total cost 66.7 percent was for growing, 9.8 for harvesting, 20.1 for storing, and 3.4 percent for selling. Cost of production decreased as size of potato enterprise increased. Average yield was 109 bbl., man-labor in growing and harvesting 72 hr., value of tractive power and equipment $59, and cost of production $108 per acre on farms having less than 30 acres of potatoes as compared with 125 bbl., 58 hr., $44, and $104 on farms having 50 acres or more of potatoes. Cost was $102 per acre and $1.23 per barrel with yields less than 95 bbl. per acre as compared with $116 and 77 ct. per barrel, respectively, with yields of over 140 bbl. When hours of man-labor were less than 50 per acre, the cost was $97 per acre and 84 ct. per barrel as compared with $113 and 97 ct., respectively, where 80 hr. or more of labor were used. The cost was $101 per acre and 88 ct. per barrel on farms having less than $40 invested per acre in tractive power and machinery and $112 and 95 ct. per barrel, respectively, where the investment was $60 or more per acre.

The economics of certified seed potato production.—II, Factors which affect the cost of production, J. A. Hitchcock (*Vermont Sta. Bul. 504 (1943), pp. 71, illus. 8*).—This second bulletin (E. S. R., 72, p. 120) includes detailed analysis of the data, usually by the individual years 1928, 1929, and 1930, to show the effects on costs of production of different items relating to seed, fertilizers, fungicides, labor, power, machinery, land, and miscellaneous costs. Among other subjects discussed are spraying and dusting, planting and digging, effects of acreage and yields per acre on costs, the factors relating to yields, effects of acreage and yields per acre on profits, etc.

Some of the findings are summarized as follows: "Costs, especially for labor, tended to run high on very small acreages, but the correlation between cost and acreage was not close. Most of the economies that followed an increase in the scale of operations were realized by growers of as little as 8 or 10 acres, whose total cost per bushel averaged about the same as that on farms where 25 or 30 acres were grown. . . . The four items of labor, seed, fertilizer, and power accounted for three-fourths of the total cost of growing the crop. In each of these the cost per acre and the yield per acre were roughly equal in importance as determinants of the cost per bushel, suggesting that cost control, largely a matter of input control, and the obtaining of good yields were practically on a par in respect to their effect on the economy of production. In the case of the minor items of fungicides, machinery, land, and miscellaneous costs, the former seems to have been relatively more important. The total cost per acre rose steadily with increasing yields, at an average of 20 ct. for each added bushel. . . . As a consequence of this even rate of advance in cost per acre with rising yields, the cost per bushel declined, rapidly at first, and then more and more slowly, as the number of bushels produced per acre increased. The differences in cost per

bushel with varying yields were considerable. Taking the 3 yr. together the approximate average total costs per bushel were—with a yield of 100 bu. per acre, $1.40; with 200 bu., 75 ct.; with 300 bu., 60 ct.; and with 400 bu. 50 ct."

Milk price relationship between the Scranton-Wilkes-Barre and New York City markets, C. W. Pierce (*Pennsylvania Sta., Jour. Ser. Paper 1217 (1944), pp. 17, illus. 1*).—"This study was undertaken for the purpose of determining what, if any, changes are needed in Scranton-Wilkes-Barre prices to restore the market to its normal competitive position in the New York milkshed."

The Minnesota dry milk industry, E. F. Koller (*Minnesota Sta. Bul. 372 (1943), pp. 28, illus. 9*).—The wartime dry milk requirements and the United States production are briefly discussed. Using information obtained in personal interviews at 45 of the larger plants in the State and by mail for all other milk-drying plants, the production in the State; the number, location, types, and capacity of the plants; the milk supplies; the potential supplies for drying; costs of plant operation; market outlets and prices received; the wartime dry milk program for the State; and post-war prospects are discussed.

"Minnesota's total dry milk production more than tripled in the 6-yr. period, 1937–42, to reach 104 million pounds. The 1942 output of dry skim milk for human use was more than double that of the previous year. . . . As of May 1943, there were 102 drying plants in the State, of which 57 were drying milk for human use, 17 more than a year earlier. A large number of additional human food driers were being prepared during 1943. Minnesota's total drying capacity, in terms of fluid milk per hour, increased 31 percent from 314,000 lb. in 1942 to 413,000 lb. this year. Capacity of human food driers increased 55 percent."

Consumer demand for apples and oranges, W. E. Black ([*New York*] *Cornell Sta. Bul. 800 (1943), pp. 44, illus. 7*).—"The primary purpose of this study was to determine the average demand for apples by urban consumers near a producing area, and to measure the extent and causes of variation in this demand. Information similar to that for apples was obtained and analyzed for oranges." It is based on a study in Syracuse, N. Y., covering 1939–40 and 1940–41.

The degree of variation in expenditures, prices, and quantity and extent to which they varied together or in opposite directions are considered for apples and oranges. More detailed analysis is made for each fruit of the causes of variations in quantity, price, and expenditure and demand by families. Also discussed are the sources of each of the fruits, the periodic variations in the demand for apples, and the interrelationship between consumer demand for apples and for oranges.

The average yearly per capita home consumption of apples was about 56 lb. It was estimated that an additional 10 lb. per capita was consumed in public eating places. The average per capita home consumption of oranges was about 14 doz., or 62 lb. About 46 lb. of the apples were bought as fresh fruit, the average price being 2.5 ct. per pound. The other 10 lb. were bought in processed forms, the average price for the processed apples being about 3.7 ct. per pound (fresh fruit equivalent). The average price for oranges was 28 ct. a dozen. "'Variations in per capita expenditure for apples were due largely to economic necessity. Expenditure varied with family income; therefore about the same proportion of the food dollar was spent for apples regardless of income. Expenditure for apples and for all food did not increase so rapidly as income increased. Factors other than income had little effect on the per capita amount spent for apples. From the quantity standpoint, none of the factors studied were important causes of variation. . . . The price of apples was highly related to income. The high-income families paid nearly twice as much per pound as the low-income families. The net influence of other factors on price was insignificant. . . . People of higher incomes spent more for apples because they paid higher prices, not because

they bought more apples. With increases in price, expenditures increased up to a point beyond which further price increases resulted in smaller expenditures. The maximum expenditures occurred at about 7 ct. a pound for high-income families, and 3 ct. a pound for low-income families. Maximum expenditures occurred at an intermediate point of quality and marketing service. . . . Income was an important cause of differences in the demand for both fruits, but more so for oranges. Income influenced primarily the quantity of oranges consumed and the price of apples; it had little relation to the price of oranges or to the quantity of apples consumed. . . . Variations in the demand for apples as measured by quantity, price, or expenditure were found not to be related to variations in the quantity, price, or expenditure for oranges. Support of the conclusion that oranges are not seriously competitive was found by comparing uses of the two fruits and by comparing their seasons of consumption."

Agricultural statistics, 1943 (*U. S. Dept. Agr., 1943, pp. 548+*).—This usual annual volume (E. S. R., 89, p. 129) prepared by the Yearbook Statistical Committee has been reduced in size, due to wartime restrictions. "The Committee attempted, however, to retain the material which would serve the needs of the largest number of users and to omit only such data as could be dropped with a minimum of inconvenience, particularly to those who have access to the 1942 edition. The reduction for this year was attained chiefly in three ways: (1) By limiting the historical tables to data beginning with 1929 or 1930 or to the most recent 10 yr.; (2) by omitting monthly statistics (especially prices), partly because the figures for recent months must be obtained from current sources in any event; (3) by omitting all tabulations on international trade and most figures on United States imports and exports, as the publication of these data has been restricted since 1941."

Annual report on tobacco statistics, 1943 (*U. S. Dept. Agr., Food Distrib. Admin., 1943, CS–6, pp. 83+, illus. 1*).—The eighth report in the series (E. S. R., 89, p. 601).

Crops and Markets, [January 1944] (*U. S. Dept. Agr., Crops and Markets, 21 (1944), No. 1, pp. 68, illus 2*).—In addition to the usual crop and market reports and tables showing data as to employment and wages of farm labor, prices paid and received by farmers, etc., are the annual summary tables for 1943 showing the acreage, yield, and production by States of important crops for 1942 and 1943 with comparisons with the average for periods of similar length. A short article on cost of producing field crops in 1942, covering corn, wheat, oats, and cotton is also included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Teaching repair and maintenance of farm buildings in vocational agriculture schools, K. J. T. Ekblaw (*Agr. Engin., 25 (1944), No. 1, pp. 18, 20*).—The author holds that the farmer should be able to build poultry houses, swine houses, garages, machine sheds, and similar buildings himself. He should also know enough about construction in general to enable him to give intelligent supervision to the construction of larger buildings. Enough training should be given to prospective teachers in vocational agriculture to enable them to impart sufficient practical knowledge of building construction to their students. A minimum of 10 hr. per week of theory and practice for 36 weeks should be required. Most of the so-called handicraft work in shops should be eliminated and replaced with projects directly related to farm building construction. Various useful carpenters' tools should be selected and their application described. Practice in their use should be applied to such elements of building construction as laying out and leveling foundations, laying sills, setting joists and framing, systems of bracing, the proper use of different kinds of nails, rafter cutting, simple stair

construction, how to lay shingles and roofing of various kinds, how to frame and hang windows and doors, etc. Simple calculations for strength of joists, bearing capacities of different types of soil, how to prepare bills of material, and how to read simple blue prints could also well be covered. Practical work could extend to actual construction so far as possible.

FOODS—HUMAN NUTRITION

Producing maximum food per acre, G. A. Pond (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1943), No. 1, pp. 1–2, 15–16, illus. 1*).—Estimates are made of the quantities of essential nutrients (protein, fat, calories, Ca, Fe, vitamin A, ascorbic acid, thiamine, riboflavin, and niacin) to be obtained in various crops and livestock products produced per acre of land. The production figures used were based largely on accounting records from farms in southern Minnesota. Since there is wide variation in the quantities of these several nutrients as needed by individuals and as produced in the various crops, an over-all estimate of the nutritive value of each crop was made, first, by computing the number of days for which the quantity produced per acre of each of these essential nutrients would supply the dietary needs of an adult and, second, by averaging these units for the 10 nutrients in the given food item. These values, giving an arbitrary measure of the relative nutritive value of foods per acre of production, rated crops such as potatoes, soybeans, wheat (whole), corn (meal), and oats high above livestock. When values were converted further to show the nutritive units of human food per 10 hr. of man labor for specified farm crops, it was evident that livestock produce relatively less food per hour of labor as compared with crops than per acre of land. It is pointed out, however, that although livestock produce less nutritive value per acre of cropland or per man-hour, they do convert into human food the product of hay and pasture land not suited for direct use as human food. Other precautions are suggested in interpreting these tables as a guide to maximum food production.

Food values on a pound, acre, and man-hour basis for California processed vegetables, J. H. MacGillivray, A. F. Morgan, G. C. Hanna, and A. Shultis (*California Sta., [1943], pp. 15*).—Sixteen California processed vegetables, including canned, dehydrated, and frozen products, are rated by a system previously applied to fresh vegetables (E. S. R., 90, p. 706) wherein the value of the final vegetable product is considered, not only from the standpoint of its various nutritive values but also with regard to the land and labor required to produce it and prepare it for market.

On the linear arrangement of palatability of natural foods with an example of varietal preference in Leguminosae and Cruciferae by a new, rapid laboratory method, W. F. Dove. (Univ. Maine). (*Jour. Nutr., 25 (1943), No. 5, pp. 447–462, illus. 2*).—"A method is described whereby foods and varieties of foods may be arranged in a linear or hierarchal order in terms of palatability ratings. The 'substitution test' devised for this purpose allows the freedom necessary for a natural expression of nutritional behavior and yet permits controlled repetition of the experiment. . . . In order to facilitate the comparison of palatability ratings with nutritional value, the method supplies a series of Taste Tester Varieties as a preliminary standard for future comparison."

Corn germ: A valuable protein food, H. H. Mitchell and J. R. Beadles. (Univ. Ill.). (*Science, 99 (1944), No. 2563, pp. 129–130*).—The defatted (solvent-extracted at low temperature) corn germ used in these tests contained 2.94 percent ether extract, 4.18 percent crude fiber, 21.19 percent protein (N×6.25) and 25.6 μg. thiamine per gram. The digestibility and the biological value of the corn-germ protein were measured by the nitrogen balance method of Mitchell (E. S. R., 56, p. 188). The results, in comparison with similar determinations

for beef round, showed the corn-germ protein to be 85 percent as digestible as the protein of the beef round, but of equal biological value. The average biological value of 78 for this sample of corn germ is compared with previously determined values of 50–65 for cereal grains, 51–60 for nuts (72 for the cashew nut), 94 for whole egg, 90 for raw whole milk, and 62–77 for various cuts of meat and animal organs. Dried, defatted, autoclaved soybeans also tested in the present study were found to have a coefficient of digestibility of 84.4 and a biological value of 67.5. The value of corn germ as a potential source of protein in the diet is indicated by the estimated output of 1,000 million pounds per year of defatted corn germ (based on the crop yield of 1942), assuming a processing of 16 percent of the crop by dry milling and distilling and a yield of 7 percent of germ.

Commercial wheat germ, its composition, E. Grewe and J. A. LeClerc. (U. S. D. A.). (*Cereal Chem., 20 (1943), No. 4, pp. 423–434*).—Nineteen samples of commercially milled wheat-germ representing the five important classes of wheat from the United States (soft red winter, hard red winter, hard red spring, durum, and white) were analyzed by methods noted for proximate constituents and nitrogen fractions. Diastatic activity was also determined. Five composite samples, one for each class of wheat, were analyzed for mineral content (total ash, Mg, Ca, K, P, Mn, Cu, Fe, total oxides as percent of ash, Cl, and S). All of the 19 samples were contaminated to some extent with bran and endosperm; those from the hard red spring and durum wheats were the least contaminated with endosperm, as judged from their relatively low content (24 percent) of undetermined carbohydrate in comparison with the 30–40 percent in the other wheat germs. Protein varied in the 19 samples from 18.3 to 35.2 percent; fat, from 5.2 to 15.0; ash, from 3.1 to 4.9; total sugar (as invert), from 6.6 to 17.4; crude fiber from 1.6 to 3.5; other carbohydrates (by difference), from 19.2 to 53.0; Ca (in the composite samples), from 0.048 to 0.063; P, from 0.851 to 1.135; and Fe, from 0.0041 to 0.0064 percent. Maltose value, as an expression of diastatic activity, averaged 401 mg. per 10 gm. of germ for the 19 samples, with a minimum of 275 and a maximum of 560. The alcohol-soluble nitrogen of the wheat germ made up about one-seventh of the total nitrogen, the salt-soluble nitrogen over 60 percent, and the fraction regarded as albumin and globulin represented 51.2 percent of the total nitrogen of the germ. "In general, when the amount of endosperm was high the proportions of nitrogen soluble in 70-percent alcohol and the copper-hydroxide-precipitated nitrogen were high, whereas the proportions soluble in 3-percent sodium chloride and in 5-percent potassium sulfate solutions were low. . . . Of the 19 samples of wheat germ, two were granular in form and were considerably heavier than the flaked germ, the weight of one cupful or half-pint being 117 and 143 gm., respectively; the average weight of the other 17 samples was 79.1 gm., but even among these the weight varied from 65 to 98 gm."

The nutritive value of wheat germ protein, E. L. Hove and C. G. Harbel (*Cereal Chem., 20 (1943), No. 2, pp. 141–148, illus. 2*).—The biological value of wheat germ protein, calculated according to the method of Osborne and Mendel (E. S. R., 40, p. 765) as the ratio of body weight gained to the amount of protein ingested during the experimental period, was determined to be 2.87 to 2.41 with protein levels of from 9.3 to 11.7 percent. Corresponding biological values obtained with commercial casein, dry skim milk, and boiled dry egg white (fed at 10 percent protein levels) were 2.30, 2.85, and 2.58. Composite protein derived from a certain mixture of whole cereals, patent flour, and air-dried potatoes, and designated as that from "average American diet plant sources," was found to have a biological value of 1.15 when fed at a 10 percent protein level. Wheat germ and casein proteins at levels of 3.3 percent, for example, were equally effective in

supplementing this composite plant protein at a level of 6.7 percent, giving biological values of 2.12 and 2.28 for the total protein. At protein levels higher than 10 percent, wheat germ as the sole protein in the diet promoted growth in the young rats equal to that obtained on higher levels of casein, skim milk powder, or dry beef muscle. Heat processing of the wheat germ to improve its keeping quality and lessen its "green" or "feedy" taste and smell had no effect on the biological value of the protein.

"The yearly potential output of wheat germ in the United States has been calculated to have been at least 150 million lb. in 1941, assuming a milling yield of 0.5 percent. This is compared to the output of dry skim milk powder during 1941 of 500 million lb. It is suggested that wheat germ can be utilized in the human dietary and in nonruminant animal feeds as a supplemental protein of high biological value."

Wheat germ in bread making, E. Grewe and J. A. LeClerc. (U. S. D. A.). (*Cereal Chem., 20 (1943) No. 4, pp. 434–447, illus. 11*).—The effect of wheat germ in bread baking was observed in a series of baking tests in which the bread was made according to the basic formula and procedure adopted by the American Association of Cereal Chemists (1928), except that a portion of the flour was replaced by germ. The wheat germ was used either merely wetted or after steeping, i. e., soaking, in water for a period of time varying from 0.5 to 24 hr. The results, discussed in some detail, are summarized as follows:

"The steeping of wheat germ causes a marked improvement in its bread-making properties when added to flour dough. The extract of momentarily wetted germ, when separated and incorporated in bread dough, produces somewhat inferior loaves, whereas the extract of steeped germ produces a loaf as good as, or even better than, the control. The beneficial effect of steeping increases with increase in time up to 6 or 8 hr. The addition of potassium bromate, along with germ, results in an improvement in bread-making properties. Steeped germ up to 10 percent can be added to flour dough without appreciable detrimental effects on the quality of the loaf. The addition of 2.5 or 5 percent of steeped germ may give even better bread than when no germ is used. The use of 15–20 percent produces a very satisfactory bread. In a study on germ from different classes of wheat very satisfactory bread was produced when germ from white, soft red winter, hard red winter, and durum wheats was used. Germ from hard spring wheat was not so satisfactory for bread as was germ from the other classes of wheat. The addition of salt (in amounts normally used in bread making) to the germ during steeping causes an improvement in the handling properties of the dough. The colloidal properties of the germ as measured by viscosity are appreciably changed by the addition of salt solutions. The steeping of wheat germ results in an increase in its diastatic power. There is also a decrease in oxidizable substances. These changes are quite rapid at first, with some change taking place over a period of 7 hr. In order to produce the best bread, the germ should be steeped for about 3 hr. before being added to the dough or to the sponge."

The manganese content of bread and wheat products, C. Hoffman, T. R. Schweitzer, and G. Dalby (*Cereal Chem., 20 (1943), No. 3, pp. 328–333, illus. 2*).—Analyses of flours of different grades from different geographical areas as well as different years indicated that Mn content varied with the ash content. A tabulation of the analytical data to show the relationship of the Mn in bread to the ash of the flour used in its preparation suggested that the Mn content of bread can be used as a guide to the ash of the flour used. This relationship is particularly useful in the case of enriched breads, since some factor in addition to crumb color is necessary if the ash of the flour—as an indication of its type and grade—is to be reasonably well estimated. The whole-wheat flours analyzed contained 20–47 μg. Mn per gram, while the patent flour contained 3–6 μg., wheat bran 104–139

μg., and wheat germ 82–102 μg. per gram. The differences between flours were reflected in breads taken from different manufacturers and from widely separated areas; the whole-wheat breads, containing 10.5–11.1 mg. Mn per pound, were about 10 times as rich in Mn as the white breads containing 1.0–1.5 mg. per pound.

Data presented graphically suggest that within reasonable limits the Mn and Fe contents of various parts of a mill stream are proportional to the ash. The relationship is more clear-cut in the higher-ash products. Other graphs indicate that thiamine holds no definite relationship to ash, but is fairly closely related to ether extract throughout the mill stream.

Selenium distribution in milled seleniferous wheats, A. L. Moxon, O E. Olson, E. I. Whitehead, R. J. Hilmoe, and S. N. White. (S. Dak. Expt. Sta. et al.). (*Cereal Chem., 20 (1943), No. 3, pp. 376–380*).—Data are reported on the Se distribution in the various mill fractions of four samples of experimentally milled dark northern spring wheat grown in seleniferous areas of South Dakota in 1941. N : Se, S : Se, and N : S ratios for one of the samples are also reported. Of the various fractions, bran was highest in Se, containing in the four wheats, respectively, 5.9, 8.7, 88.4, and 33.4 p. p. m. (moisture-free basis); the combined flour fractions of each wheat contained, respectively, 4.1, 4.05, 53.58, and 19.06 p. p. m. The brans were not only highest in Se but also in N, which probably accounts for their high Se content, since it has been shown that Se is closely associated with the proteins of wheat.

Effect of fertilizer treatment on calcium, phosphorus, and iron content of potatoes, J. M. Leichsenring and E. G. Donelson. (Minn. Expt. Sta.). (*Food Res., 8 (1943), No. 3, pp. 194–201*).—Potatoes of four different varieties (Early Ohio, Cobbler, Triumph, and Mesaba) were grown in 14 fields of known soil type with an arrangement in plats within each field to allow the following fertilizer treatments: (1) Phosphate, (2) phosphate-potash, (3) untreated, and (4) nitrogen-phosphate-potash; in addition iron sulfate was applied to one-half of each plat. Calcium, phosphorus, and iron contents were determined in representative samples from each plat, and analyses of variance were computed on the accumulated data.

The diversity found in calcium, phosphorus, and iron values was associated with differences inherent in the soil of the various fields rather than with varietal differences or fertilizer treatment. The fertilizer treatments had no significant influence on the mineral values with the exception of phosphorus values from the plats to which phosphate alone had been added. These showed a mean increase in this element of 10.4 percent as compared with the untreated plats. Since potash or iron sulfate or both had been added to the other plats, it appeared that these applications suppressed phosphorus utilization. A mean decrease of 4.3 percent in calcium values resulted from iron sulfate treatment, and the potatoes contained a significantly smaller amount of iron than those from plats to which no iron sulfate had been applied. There was a highly significant positive correlation between phosphorus and iron values for potatoes from plats treated and not treated with iron sulfates; calcium and iron and also calcium and phosphorus values were positively correlated for potatoes from the untreated plats, but this relationship did not hold for potatoes from plats treated with iron sulfate. Paring potatoes resulted in significant losses in total iron and calcium, 10.5 and 24 percent, respectively, indicating that these elements are more highly concentrated in the skin and cortical layer. The phosphorus appeared to be concentrated in the medulla of the tuber, since significantly higher values, 6.5 percent, were obtained for the pared than for the unpared samples.

The availability of the calcium of some New Zealand vegetables, J. Kelly (*Jour. Nutr., 25 (1943), No. 3, pp. 303–308*).—Growing rats were utilized in paired feeding experiments conducted for 9 weeks in which calcium intakes

and, as far as possible, weight gains were equalized. Calcium retention as an indication of calcium availability was determined by carcass analysis of rats fed the test foods; litter-mate controls were also analyzed. The availability of the calcium in the various vegetables was compared with that of the calcium of skim-milk powder at levels of calcium intake insufficient to permit maximum calcification of the bones. From results obtained, the following conclusions are drawn: "The calcium of milk is better utilized than the calcium of the vegetables tested. The Savoy cabbage tested is an excellent source of calcium, since its content of this element is very high; under the conditions of these experiments, this calcium was 93 percent as available as that of milk. The calcium of swede turnips and parsnips is very well utilized. Under the conditions of these experiments, their calcium was 87 and 88 percent, respectively, as available as that of milk. Silver beet greens are a poor source of calcium in the diet, comparable in value to spinach, since, under the conditions of these experiments, their calcium was only 46 percent as available as that of milk." Average calcium values for the foods tested were as follows: Silver beet greens 0.084 percent, rutabaga 0.043, cabbage 0.10, parsnip 0.040, and skim-milk powder 1.34 percent.

Effect of fertilizer, soil composition, and certain climatological conditions on the calcium and phosphorus content of turnip greens, O. A. Sheets, L. McWhirter, W. S. Anderson, M. Gieger, L. Ascham, H. L. Cochran, M. Speirs, R. Reder, J. B. Edmond, E. J. Lease, J. H. Mitchell, G. S. Fraps, J. Whitacre, S. H. Yarnell, W. B. Ellett, R. C. Moore, and H. H. Zimmerley. (Miss., Ga., Okla., S. C., Tex., Va., and Va. Truck Expt. Stas.). (*Jour. Agr. Res.* [*U. S.*], *68 (1944), No. 4, pp. 145–190, illus. 3*).—This report presents in detail the plan and the results of a cooperative project to determine the effects of place and of fertilizer treatments on the calcium and phosphorus content of turnip greens. Seed of the variety Seven Top from the same source, as well as uniform methods of planting and fertilizing, were used in the 19 nonfactorial experiments conducted in 12 localities and the 30 factorial experiments conducted in 19 localities. Soil samples, from 29 of the sites, and samples of turnip greens harvested at a good marketable stage were analyzed. The results of the experiments were analyzed statistically. In both the factorial and the nonfactorial experiments there was a marked variation in the calcium and phosphorus content of the greens grown at different places and significant differences at the same place at different seasons. Results from the factorial experiments showed that conditions associated with the place caused from 13 to 20 times more variation in the calcium and phosphorus content of the greens than did the fertilizer, and that the effects produced by the different treatments varied with the season. Soil properties accounted for an important part, but not all, of the variation in mineral content of the greens attributed to place. Rainfall appeared to exert no consistent effect, but at one place irrigation significantly increased both the plant calcium and phosphorus. The effects of fertilizer treatments (discussed and summarized) were found to be highly significant although not as great as the effect of place. The average yield (13 experiments) was 174.53 gm. per foot of row. The low-error experiments showed that yield was significantly increased by the application of N, P, K, and Ca, but that the greatest increase (approximately one-third of the total yield) was produced by N. The variation in yield in these experiments caused by place was about 7 times greater than that caused by the fertilizer treatments.

Foods and drugs, E. R. Tobey (*Maine Sta. Off. Insp. 187 (1943), pp. 121–231*).—This report (E. S. R., 88, p. 545), presenting the results of analyses and other pertinent information on official inspection samples of foods and drugs, includes the following on foods: Data on specific gravity, butterfat, solids-

not-fat, total solids, sediment, and plate count of many samples of raw and pasteurized milk; butterfat and plate count of cream designated by grade purchased; fat in ice cream; weight per gallon, moisture, sucrose, ash, lead number, and lead content of maple sirup; tests concerning nature of oil used in packing sardines; physical and chemical constants of olive oils determined for testing their purity; and data on proportion of free liquid and percentage of solids on drained meats of shucked clams.

Food preparation of owner and cropper farm families in the Shortleaf Pine area of Mississippi, D. Dickens. (Miss. Expt. Sta.). (*Social Forces, 22 (1943), No. 1, pp. 56–63*).—This report is based upon food preparation schedules obtained from 250 families, including 59 white and 64 Negro owners and 57 white and 70 Negro croppers, selected as representative of the region.

The homemakers were asked about how often 12 foods common to the region were served, and for those served frequently what methods of preparation were most commonly used at the time of the study and in their parental homes when they were children. Each homemaker was also asked if she had tried any new methods of preparing vegetables within the past year and if so how she had learned the method and how well it was received by the members of her family.

Few differences were found in the methods of preparing fat back, young chicken, sweetpotatoes, and canned tomatoes by the various groups, and of these foods only canned tomatoes seemed to be used more frequently at the time of the study by the white owner group than in the parental homes of the wives of this group. Differences in methods used by the four groups were found in the preparation or the serving of corn bread, biscuits, milk (sweet milk v. buttermilk), eggs, and cooked and raw cabbage. The differences in the preparation of these foods are discussed in some detail as well as new ways of preparation of vegetables. Homemakers in white owner homes were at one end of the scale and Negro cropper homemakers at the other in following practices recommended by food preparation specialists. The white owners had more contacts with educational agencies dealing with family food and nutrition and more reading material. Wives of Negro croppers were less likely to have been reared in homes following good food practices or to be associated with relatives and friends following good practices. It is emphasized, however, that different socioeconomic groups have different methods of food preparation and that these should be taken into consideration in attempts to improve food preparation habits.

"This study suggests a new approach to improving food preparation; that is, to study new methods of preparing foods actually tried within a recent period by homemakers of families in various socioeconomic groups, and why these methods were tried and the family reaction to the methods. Such data will give a sound basis for working out food preparation material acceptable to various socioeconomic groups."

Potatoes in the diet, J. M. Leichsenring (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1943), No. 1, pp. 5–6, illus. 3*).—An investigation, noted in part on page 92 and dealing with the effect of variety differences and locality in which grown on the vitamin and mineral content of potatoes, showed that potatoes are valuable sources of phosphorus, iron, thiamine, ascorbic acid, and niacin.

Handbook of nutrition (*Chicago 10: Amer. Med. Assoc., 1943, pp. 585, illus. 22*).—This symposium, prepared under the auspices of the Council on Foods and Nutrition of the American Medical Association, brings together a recent series of papers appearing in the *Journal of the American Medical Association* and covering the following topics: Proteins in Nutrition, by H. B. Lewis (pp. 13–32); Role of Fat in the Diet, by W. R. Bloor (pp. 33–54); Calories in Medical Practice, by E. F. Du Bois and W. H. Chambers (pp. 55–69); Water and Salt Requirements

in Health and Disease, by J. H. Talbott (pp. 71–89) ; Principal Mineral Elements in Nutrition, by I. G. Macy (pp. 91–114) ; Iron in Nutrition, by C. W. Heath (pp. 115–128) ; Iodine in Nutrition, by G. M. Curtis and M. B. Fertman (pp. 129–152) ; The Trace Elements in Nutrition, by M. E. Shils and E. V. McCollum (pp. 153–183) ; the Fat Soluble Vitamins, by H. R. Butt (pp. 185–212) ; The Water Soluble Vitamins, by C. A. Elvehjem (pp. 213–239) ; Foods of Plant Origin, by L. A. Maynard (pp. 241–257) ; Foods of Animal Origin, by H. C. Sherman (pp. 259–278) ; Unusual Foods of High Nutritive Value, by R. M. Wilder and T. E. Keys (pp. 279–296) ; The Preservation of the Nutritive Value of Foods in Processing, by E. F. Kohman (pp. 297–318) ; Improving the Quality of Cheap Staple Foods, by G. R. Cowgill (pp. 319–332) ; Recommended Dietary Allowances (pp. 333–338) ; The Feeding of Healthy Infants and Children, by P. C. Jeans (pp. 339–363) ; Feeding the Aged, by E. L. Tuohy (pp. 365–384) ; Nutritive Requirements in Pregnancy and Lactation, by J. H. Ebbs (pp. 385–402) ; Adequacy of American Diets, by H. K. Stiebeling (pp. 403–424) ; Medical Evaluation of Nutritional Status, by H. D. Kruse (pp. 425–471) ; Nutrition in Preventive Medicine, by W. H. Sebrell (pp. 473–519) ; Conditioned Malnutrition, by N. Jolliffe (pp. 521–543) ; and Principles of Diet in the Treatment of Disease, by T. D. Spies (pp. 545–562).

Nutrition, M. S. Chaney and M. Ahlborn (*Boston: Houghton Mifflin Co., 1943, 3. ed., [rev.], pp. 436+, illus. 55*).—This book, planned as a text in nutrition for home economics students at the college level, has been noted from earlier editions (E. S. R., 82, p. 274). In the present revision the sections on the vitamins have been entirely rewritten, the tables on food composition have been amplified and brought up to date, and a chapter dealing especially with the selection of an adequate dietary has been rewritten to cover group studies on nutritional status and the educational activities which have followed the National Nutrition Conference for Defense.

Annual review of physiology, V, edited by J. M. Luck and V. E. Hall (*Stanford University, Calif.: Amer. Physiol. Soc. and Ann. Rev., Inc., 1943, vol. 5, pp. 613+*).—Included among the reviews presented in this volume (E. S. R., 88, p. 409) are the following of particular interest from the standpoint of nutrition; Physiology of Bone, by F. C. McLean (pp. 79–104) ; Energy Metabolism, by E. B. Forbes and L. Voris (pp. 105–122) (Pa. State Col.) ; The Digestive System, by R. C. Herrin (pp. 157–180) ; Blood, by H. D. Bruner (pp. 181–206) ; Liver and Bile, by J. L. Bollman (pp. 321–344) ; Metabolic Functions of the Endocrine System, by B. A. Houssay and V. Deulofeu (pp. 373–398) ; and Biological Assay, by C. I. Bliss and M. Cattell (pp. 479–539) (Conn. [New Haven] Expt. Sta. et al.).

Need for observations of growth in appraising adequacy of nutrition in childhood, H. C. Stuart (*Amer. Jour. Diseases Children, 65 (1943), No. 2, pp. 320–325*).—It is urged that, as far as practicable, children be measured for growth in connection with nutrition research, especially in surveys of nutrition, and that the evidences of faulty growth be given more consideration in appraisals of nutrition. Measurements from a roentgenogram of the leg taken in a standardized manner (E. S. R., 90, p. 277) are recommended. It is further suggested that the children be chosen with age carefully controlled and sexes always differentiated; that time intervals between repeated measurements of all individuals be kept closely to the interval chosen for the group; and that the procedure always involve establishment of a base line for the particular group, with repetition of the same observations under as closely identical conditions as possible. Averages for the group, if it is of adequate size, will then largely eliminate any errors of individual measurements.

Fat excretion by normal children, H. H. Williams, E. N. Endicott, M. L. Shepherd, H. Galbraith, and I. G. Macy (*Jour. Nutr., 25 (1943), No. 4, pp. 379–387*).—The subjects of this investigation, 19 healthy children between the

ages of 4 and 12 yr., were given diets of high nutritive quality while being maintained on continuous metabolic regimes for from 30 to 225 days. Five-day composites of all food ingested were analyzed for fat by the Soxhlet extraction procedure and similar composites of feces for lipids by the method of Tidwell and Holt as modified by Macy (E. S. R., 88, p. 851).

The fat intakes ranged from 62 to 113 gm. per day and the utilization from 96 to 98 percent. The average daily excretion of lipids amounted to 2.3 gm. daily, representing an average of 13 percent of the fecal dry weight. The partition of the lipids in the feces was determined in samples dried from a frozen state under vacuum from eight children over 11 consecutive 5-day periods. Four of the subjects received 83 gm. of fat per day and the other four 113 gm., or 3.1 and 3.2 gm. per kilogram of fat, respectively. "Excretion of free fatty acid, neutral fat, and unsaponifiable material was approximately equal for all the subjects, but the soap excretion was significantly higher for the children with the larger fat intakes, 1.93 ± 0.36 gm. (54.2 mg./kg.) as compared with 1.40 ± 0.55 gm. (52.1 mg./kg.) For all the children soaps comprised approximately 50 percent of the total fecal fat, unsaponifiable fat represented approximately 30 percent, and the remainder was almost equally divided between free fatty acid and neutral fat."

The effect of iron on the hemoglobin regeneration in blood donors, A. P. Barer and W. M. Fowler (*Amer. Jour. Med. Sci., 205 (1943), No. 1, pp. 9–16*).—Male subjects who made multiple blood donations were subjected to continuous or intermittent iron therapy over a series of postdonation periods. It was observed in these trials, in confirmation of the earlier findings (E. S. R., 88, p. 411), that the administration of iron to the blood donors hastened the regeneration of hemoglobin, but that the effect of the iron therapy was transient. If the drug was given continuously with repeated blood donations, the effect of the iron became less marked during the second recovery period and there was no effect on the rate of hemoglobin regeneration during subsequent recovery periods, except that in most of the individuals there was a secondary and late increase after five or six donations. This response, however, was not as great as the first response. The availability of the iron, the amount of iron reserves in the body, and the serum iron level apparently failed to account entirely for this observed effect, suggesting that iron, in addition to acting in replacement therapy, also exerts a stimulating effect on hemoglobin formation. There was no evidence of bone marrow exhaustion after repeated donations.

[Nutritional status of University of Maine freshman women as related to their diets] (*Maine Sta. Bul. 420 (1943), pp. 517–520, 532–533*).—This progress report (E. S. R., 87, p. 302; 89, p. 141) includes a partial summary of the data secured during the 3-yr. study, including tabulated data on the results of physical and dental examinations.

Approximately one-fifth of the subjects were underweight according to the McCloy standards and about one-tenth appeared to be overweight. Poor posture, weak arches, and dental caries were common. The number showing hemoglobin values under 85 percent with 14 gm. considered normal was considerably less in the 1942–43 examination than in the two previous years—7.9 percent in 1942–43 in comparison with 32 percent in 1941–42 and 11.6 percent in 1940–41. The home diets were somewhat better in 1942–43 than in the two previous years due to increased use of citrus fruits and tomatoes, leafy, green, and yellow vegetables, other fruits and vegetables, and whole grain or enriched cereals and bread. However, approximately one-third of the girls did not meet the standard for consumption of leafy, green, and yellow vegetables and approximately one-half the standard for whole-grain products.

Rations and food consumption in Sweden during 1942–43, C. Boalt and Y. Zotterman (*Nature [London], 152 (1943), No. 3865, pp. 635–636*).—The daily

food rations in Sweden in February 1943 for children in seven age groups and for five categories of adults—ordinary rations, heavy workers, lumbermen living at home, lumbermen not living at home, and pregnant women—are tabulated in meal and grain, fats, meat, sugar, peas, cheese, and eggs and in total calories, and these values are compared with actual consumption figures as obtained from individual food consumption records of 52 households and 1 lumbermen's canteen during the winter of 1942–43. From the body weight, height, age, and sex of each subject the basal metabolism was calculated, and the influence of the occupation upon the energy metabolism was determined by expressing the excess of energy supply over basal needs as a percentage of the latter. In 17 of the families the head was a lumberman; in 20 a millworker; and in 15 a clerk in a factory or bank. The total number of individuals was 212, of whom 76 were men, 59 women, and 77 children under 15 yr. of age.

The lumbermen showed the highest consumption of energy, with an average of 4,600 calories per 24 hr., followed by millworkers 3,800, clerical workers 2,600, lumbermen's wives 2,500, and other women 2,200 calories. The children's energy consumption increased linearly with age. The lumbermen whose rations furnished a total of 2,736 or 2,781 calories exceeded their rations of flour and grain and of fats by an average of 60 percent. The millworkers also exceeded their rations of these high energy foods, while the clerical workers and women lived within their rations and their youngest children well below them. Similar comparisons for the various food items for different ages and occupations are reported as well as food costs in terms of occupational groups. "The investigation has accentuated the desirability of a strongly differentiated system of food rationing where the greatest possible consideration should be given to occupation, age, and sex. A general principle during partial rationing should be to balance the rations so that an individual's energy requirement can be covered by a reasonable consumption of free foods."

Post-war nutritional relief in Europe (*Nature* [*London*], *152* (*1943*), *No. 3865, pp. 615–617*).—A brief account is given of a meeting of the English Group of the Nutrition Society (Great Britain), held on November 6, 1943, to discuss the scientific and medical aspects of post-war nutritional relief. Among the topics considered were the current state of nutrition in occupied Europe and elsewhere as compared with conditions during and immediately following the war of 1914–18, problems of agricultural production in relation to post-war nutritional relief, the organization of nutritional relief in the field, and opportunities for nutritional research in the work of relief.

Foods (*Maine Sta. Bul. 420* (*1943*), *pp. 520–527*).—Determinations of riboflavin by a fluorometric procedure showed the following values expressed in micrograms per gram of fresh material: Spinach 2.31–3.00, dandelions 1.43, celery 0.53, fiddleheads (ostrich fern) 1.05, canned mustard spinach, 1.31–1.43 in the solids and 0.91–1.00 in the liquid (containing about 36 percent of the total riboflavin in the can). Out of 75 varieties of apples, only 11 varieties gave ascorbic acid values in excess of 16 mg. per 100 gm. The range of values for all varieties was from 2.0 to 27.5 mg. in the raw peeled Maine apples harvested in 1942. Ascorbic acid in 53 varieties of potatoes, including 2 wild varieties, ranged from 20 to 40 mg. per 100 gm. The varieties Katahdin and Sebago were among the high-testing varieties. Ascorbic acid values apparently were not associated with tuber size or shape, eye depth, starch content, or earliness. The skin of tomatoes (Farthest North C variety) contained 52 mg. of ascorbic acid per 100 gm., the outer fruit wall 34 mg., and the radial wall and gelatinous pulp 28 mg. per 100 gm. Canned tomato juice lost no ascorbic acid in the canning process, but very large losses (34–57 percent) occurred during storage over a period of 8 mo. Losses

caused by boiling stirred canned tomato juice for 2 min. or by keeping it warm over hot water for 1 hr. were small. Rutabagas (Morrill variety) averaged 49 mg. of ascorbic acid per 100 gm. when raw and 43 mg. when cooked.

Minimum vitamin A requirements in infants as determined by vitamin A concentration in blood, J. M. Lewis and O. Bodansky (*Soc. Expt. Biol. and Med. Proc., 52 (1943), No. 4, pp. 265–266*).—Daily supplements of 150, 600, and 1,200 units of vitamin A in the form of U. S. P. reference cod-liver oil were given for a period of 4 weeks to 12 infants from 3 to 7 mo. of age whose blood levels of the vitamin had been made subnormal on diets devoid of vitamin A. In the 600-unit group, an infant was included whose blood vitamin A level, 48 units, was in the normal zone. Determinations of the blood levels of vitamin A at the end of the experiment by the method noted briefly (E. S. R., 88, p. 282) showed that the two lower intakes had no apparent effect on the vitamin A concentration in the blood, but that an intake of 1,200 units increased the A levels of the five infants receiving this dosage to within the normal range. The infant whose blood level was 48 units per 100 cc. at the beginning was unable to maintain this level on 600 units of vitamin A daily. It is concluded that if the blood concentration of vitamin A is used as a criterion of vitamin A adequecy, the daily minimum requirements for infants under 7 mo. of age lies somewhere between 600 and 1,200 units, or 100 to 200 units per kilogram body weight. In an earlier study (E. S. R., 83, p. 849), the requirement as determined by dark adaptation was established at 25 units per kilogram. "Thus, more than four times and probably close to eight times as many units are required when the blood level of vitamin A rather than dark adaptation is used as the basis for estimating the vitamin A status of the infant."

Nutritional dermatoses in the rat.—VIII, Vitamin A deficiency, M. Sullivan and V. J. Evans (*Jour. Nutr., 25 (1943), No. 4, pp. 319–339, illus. 12*).—In continuation of the series of papers, some of which have been noted (E. S. R., 85, p. 415), data are reported on the skin lesions (both macroscopic and microscopic) in rats deficient in vitamin A alone or combined with other deficiencies, such as inadequate B vitamins, fat, and fatty acids. It was shown that lesions most commonly described as due to lack of vitamin A are complicated by these other deficiencies, singly or combined. The lesions on uncomplicated A deficiency with the B vitamins furnished by yeast at a 10 percent level and with lard as the fat resembled, on microscopic examination, changes described by Frazier and Hu (E. S. R., 67, p. 482) as observed in Chinese soldiers and attributed to vitamin A deficiency. When the basal diet furnished only 5 percent of yeast and no choline, the lesions were complicated by others similar to those described in an earlier paper of the series as due to B complex deficiency. When hydrogenated cottonseed oil was used instead of lard, the lesions were similar but more severe. These findings suggest that the U. S. P. vitamin A assay diet which contains vegetable oil as fat and only 8 percent of yeast should be revised when the object is to obtain a picture of uncomplicated A deficiency. In experiments in demonstration of this, a comparison was made of the growth and skin lesions in rats kept on the U. S. P. A-deficient diet and in one of the groups of rats receiving 10 percent lard instead of the recommended 5 percent of vegetable fat, and yeast at a 10 percent instead of 8 percent level. Supplementation with choline and vitamin E is also recommended.

The adoption of crystalline vitamin B_1 hydrochloride as the new international standard of vitamin B_1 and comparison of its potency with that of the former standard, edited by T. F. Macrae (*League Nations Health Organ. Bul., 9 (1940–41), No. 4, pp. 371–424, illus. 2*).—This report presents the detailed individual reports and a summary of the results of the collaborative tests carried out in 17 different laboratories in Europe, America, and Japan, in order to com-

pare the potency of the old and the new standard of vitamin B_1. These cooperative tests arranged for by the vitamin B_1 subcommittee of the [British] Accessory Food Factors Committee were carried out upon recommendations of the Second International Conference on Vitamin Standardization (1934) that the potency of the standard vitamin B_1 clay adsorbate be tested in comparison with crystalline vitamin B_1 with the aim of ultimately adopting the latter as the international standard. It was upon the basis of the studies here described that the vitamin B_1 subcommittee proposed "that pure synthetic vitamin B_1 be adopted as international vitamin B_1 standard and that the international unit be defined as the vitamin B_1 activity of 3 μg. of the pure material."

The vitamin B complex of peeled wheat bread, R. R. Sealock and A. H. Livermore (*Jour. Nutr., 25 (1943), No. 3, pp. 265–274, illus. 1*).—The bread used for these assays was baked by a commercial bakery from "peeled wheat" flour produced by the flotation process of Earle and representing 98 percent of the original weight of the wheat berry. The vitamins were determined in the breads—and in some cases in the flour—by methods noted, these including microbiological and rat-growth procedures and, for niacin, microbiological, dog-weight, and chemical procedures. Some of the vitamins were also determined in bread made with high-vitamin yeast instead of regular yeast. The vitamin values of the fresh peeled wheat bread expressed in micrograms per gram averaged as follows: Thiamine 3.0, riboflavin 2.5, niacin 35, pantothenic acid 5.2, pyridoxine 3.1, and inositol 644. The high-vitamin yeast bread contained 4.6 μg. thiamine, 4.9 pantothenic acid, 365 inositol, and 44 μg. niacin per gram, these values indicating the increased thiamine and niacin values attained by the use of this special yeast. The peeled flour was found to have the following vitamin content in micrograms per gram: Thiamine 5.8, niacin 72, pantothenic acid 9.6, and inositol 1,100. The dried bread, fed at the level of 3 gm. per day to white rats on a vitamin B complex-free basal ration, supported their growth, thus confirming the assay values obtained for the bread. In addition, consumption of the dried bread at levels of 2.5–5.0 gm. daily for 4 weeks resulted in the curing of gray hair in black rats in approximate proportion to the pantothenic acid content of the bread. The data for niacin in bread indicated the discrepancy between values obtained by the methods used; those by the microbiological method of Snell and Wright and the dog-weight method of Waisman et al. showed the best agreement (30 and 40 μg. per gram, respectively). It is noted that satisfactory extraction procedures represent the greatest difficulty in determining vitamin concentrations.

The vitamin B_1 content of wheat-germ and germ bread, E. C. G. Wilson (*New Zeal. Jour. Sci. and Technol., 24 (1942), No. 1B, pp. 25B–34B, illus. 3*).—The vitamin B_1 determinations were conducted by a procedure described, this being the standard rat-growth method of Coward (E. S. R., 79, p. 710) wherein the growth of young vitamin B_1-depleted rats fed with the food in question was compared with that of others dosed with the International Standard of vitamin B_1. In tests in which the air-dried bread, either germ bread or, as a control, the white bread, constituted 30 percent of the diet, the breads made with 2 percent of wheat germ appeared to be only slightly better than white bread made from the same white flour but without the addition of the wheat germ. The wheat germ itself, assayed at 1- and 2-percent levels in the diet, averaged 5.16 International Units per gram. Bread made with 10 percent wheat germ, white bread, and whole-meal bread, compared in assays in which they were fed air-dry at 10 percent levels averaged, on the original moisture basis, 0.75, 0.12–0.29, and 1.40 I. U. per gram, respectively. Probable errors in these estimations, such as those due to the small number of rats, possible coprophagy and refection, and rate of growth, are discussed.

The effect of baking-powder on the vitamin B_1 content of wholemeal, E. C. G. Wilson (*New Zeal. Jour. Sci. and Technol., 24 (1942), No. 1B, pp. 35B–38B, illus. 1*).—Breads baked from the same lot of whole-meal flour by the same recipe and under the same baking conditions but differing in the nature of the leavening agent—yeast in one case and baking powder in the other—were tested biologically for their vitamin B_1 content by the standard rat-growth method of Coward (E. S. R., 79, p. 710), interpreted by a curve of response. The results obtained with the baking powder bread fed at 15 and 20 percent levels and the yeast bread at a 7.5 percent level gave average values of 1.3 and 2.1 International Units per gram, respectively. When the results at 10 percent levels were included, the respective averages were 1.3 and 1.7 I. U. per gram. From these two sets of results and with allowance for the very slight amount of vitamins added by the yeast, it is considered reasonable to state that about 30 percent of the vitamin B_1 of whole meal may be destroyed by the use of baking powder.

The blood level of vitamin B_1 in healthy children and its relation to the urinary thiamine, R. A. Benson, C. M. Witzberger, L. B. Slobody, and L. Lewis (*Jour. Ped., 21 (1942), No. 5, pp. 659–664, illus. 2*).—For 22 boys and 23 girls ranging in age from 4 to 12 yr., from 3 to 5 determinations were made within a week of the total vitamin B_1 (cocarboxylase + free thiamine) content of the whole blood. The children were clinically healthy and were in a state of thiamine saturation, as indicated by the daily excretion of at least 20 percent of the adequate dietary intake of thiamine. In 177 determinations, the blood level of vitamin B_1 ranged from 4.8 to 12.3 μg. per 100 cc., with a mean of 7.8±1.3 μg. The lowest average blood level for a single subject was 6.4 and the highest 9.9 μg. per 100 cc. Dietary thiamine intakes ranged from 630 to 1,170 μg. and urinary thiamine excretion from 137 to 404 μg. per day. The daily variations in blood vitamin B_1 in an individual child did not follow the daily urinary thiamine outputs. The height of the vitamin B_1 blood level had no relationship to the amount of thiamine excreted or to the percentage of the dietary thiamine excreted in the urine.

Thiamin losses in toasting bread, D. E. Downs and R. B. Meckel (*Cereal Chem., 20 (1943), No. 3, pp. 352–355*).—Chicago market samples of three types of bread—unenriched white, enriched white, and 100-percent whole-wheat bread—were used for toasting, matched samples from each type of bread being toasted for five different intervals of time from 30–70 sec. Data for moisture and thiamine, determined by the fermentation method of Schultz, Atkin, and Frey (E. S. R., 88, p. 293), are reported for the toasted and untoasted samples. The thiamine values, when calculated to the uniform basis of 38 percent moisture, indicated that thiamine loss occurred with toasting, the loss increasing with increase in heat penetration and with increase in time. The loss for the enriched white and whole-wheat breads varied from about 4–5 percent for 30-sec. toast to 17–21 percent for 70-sec. toast. Corresponding apparent losses for unenriched white bread were 9 and 31 percent respectively; this discrepancy is associated, however, with the difficulty of measuring accurately, by the assay method used, such small amounts of thiamine as remained in this toast. The unenriched white, enriched white, and whole-wheat breads averaged, respectively, 0.86, 2.76, and 3.36 μg. thiamine per gram (38-percent moisture basis) and the corresponding 50-sec. toasts (representing the degree of toasting most generally preferred by the panel of 10 persons) contained 0.69, 2.40, and 2.94 μg. per gram. Six slices of these toasts were estimated to contain, respectively, 0.110, 0.414, and 0.462 mg. of thiamine.

The nicotinic acid content of common fruits and vegetables as prepared for human consumption, W. C. Russell, M. W. Taylor, and J. F. Beuk. (N. J. Expt. Stas.). (*Jour. Nutr., 25 (1943), No. 3, pp. 275–284*).—Nicotinic acid was determined by the microbiological method of Snell and Wright (E. S. R., 87, p. 12)

in market samples of 13 fresh vegetables in both the raw and the cooked state, 8 fresh raw vegetables, 6 cooked dried legumes, 3 canned vegetables, 7 fresh fruits, and 10 canned fruit juices. Fresh peas containing 1,380–1,820 μg. nicotinic acid per 100 gm., fresh asparagus containing 1,100–1,200, and, avocado, 927–1,020 μg. per 100 gm., were the richest in nicotinic acid; while certain fruits and fruit juices with values of about 90 μg. per 100 gm. were the lowest. "Seeds of legumes, both fresh and dried, gave fairly high values, while the values of root crops and blanched leaves were low. Considerable variation was found among different samples of the same crop. During cooking there was a loss of the factor which averaged as follows: Fresh legumes 8 percent, roots and tubers 9 percent, flowery plants 17 percent, and leafy plants 22 percent. In addition, the cooking water contained from 2 to 41 percent (average 12 percent) of the total nicotinic acid. The liquid associated with the canned vegetables contained from 30 to 40 percent of the total nicotinic acid."

The effect of pantothenic acid on the rate of intestinal absorption of galactose in the rat, J. R. Leonards and A. H. Free (*Jour. Nutr., 25 (1943), No. 4, pp. 403–410*).—The general procedure and technics were identical with those described in an earlier study of the effect of a deficiency of the B complex on intestinal absorption of galactose (E. S. R., 89, p. 400). In 18 litter-mate pairs of rats, in which one member received a synthetic diet deficient in pantothenic acid only and the other the same diet supplemented with 100 μg. of calcium pantothenate daily, the rate of intestinal absorption of galactose by the controls averaged 15 percent more than that of the deficient animals, although 1 hr. after the ingestion of the sugar the blood galactose levels were essentially the same in both groups. Supplementation of an adequate stock diet for rats with 300 μg. and 1,000 μg. of calcium pantothenate daily had no effect on the rate of intestinal absorption. These observations do not support the findings of Russell and Nasset (E. S. R., 88, p. 135) that calcium pantothenate caused marked increase in the rate of carbohydrate digestion and absorption in the dog. Certain differences in the plan of the two experiments are pointed out.

Observations on induced riboflavin deficiency and the riboflavin requirement of man, R. D. Williams, H. L. Mason, P. L. Cusick, and R. M. Wilder (*Jour. Nutr., 25 (1943), No. 4, pp. 361–377*).—The general plan of earlier studies on thiamine requirements (E. S. R., 88, p. 710) was followed, using as subjects women from the same institution who had been on an ample diet supplemented for several weeks or months with synthetic vitamins of the B group, including 2.0 mg. of riboflavin daily, and were thus presumably well stocked with riboflavin at the beginning of the experimental feeding period. Four subjects (group 1) were used in a study of isolated restriction of riboflavin and two (group 2) restriction of all of the members of the B complex. Two others (group 3) served as positive controls and, incidentally, for a study of requirements for saturation, and five (group 4) for a study of the effect of slight restrictions of riboflavin. The standard diet for the first three groups was composed of foods commonly appearing on American tables, and the diet for group 4 differed from the standard only in the bread component by means of which the content of riboflavin could be altered.

The subjects in group 1, maintained for 288 days on a diet containing only 0.35 mg. of riboflavin per 1,000 calories, showed as the only evidence of riboflavin deficiency progressive decrease in the excretion of a test dose of 2.0 mg. of sodium riboflavin, indicating progressive depletion of tissue stores. The subjects in group 2, maintained for 246 days on a diet moderately deficient in all of the B vitamins, also showed no evidence of riboflavin deficiency beyond a progressive decrease in excretion, but within 100 days a deficiency syndrome

essentially the same as previously described for chronic moderate restriction of thiamine developed and was cured by the oral administration of 15 mg. of thiamine hydrochloride daily. In the two subjects of the control group, the depletion of tissue stores was prevented by a riboflavin intake of 0.8 mg. per 1,000 calories. In group 4, a riboflavin intake of 0.5 mg. per 1,000 calories was associated with only a very slight depletion of tissue stores.

"The data thus appear to justify a tentative conclusion that the minimal requirement for riboflavin of these subjects was in the neighborhood of 0.5 mg. per 1,000 calories and that it certainly did not exceed 0.8 mg. per 1,000 calories. The allowance of riboflavin of 2.2 mg. per day (0.88 mg. per 1,000 calories) which was recommended for a moderately active woman by the Food and Nutrition Board of the National Research Council thus appears to provide a liberal margin of safety."

Superficial vascularization of the cornea: The result of riboflavin therapy, H. R. Sandstead (*Pub. Health Rpts. [U. S.], 57 (1942), No. 48, pp. 1821–1825*).—Data are reported on the prevalence of superficial vascularization of the cornea in 366 residents of Hagerstown, Md., or its immediate vicinity, and on the effects of riboflavin therapy in 52 of the number. The groups consisted of 107 white children (55 boys and 52 girls) in a parochial school, 190 National Youth Administration youths (29 male and 161 female) of whom 14 were Negroes, 57 male adults in a National Defense Training School, and 12 other adults. All of the subjects were examined by binocular corneal microscope with slit-lamp illumination. Most of the examinations were made independently by two examiners.

Superficial vascularization was very prevalent. By groups, 82.2 percent of the parochial school children, 93.7 percent of the N. Y. A. youths, and 79.7 percent of the adults showed some degree of vascularization. In the riboflavin treatment tests 24 youths, 5 older male subjects, and 22 children, all with capillary invasion in varying degrees, were selected and divided into control and riboflavin feeding groups. The older subjects in the latter group received 5 mg. of riboflavin three times daily for 60 days and the children 5 mg. twice daily for 49 days. Examination of the subjects at the end of the test periods revealed no significant change in the degree of corneal vascularization which could be ascribed to the riboflavin. "At the present time, therefore, it seems doubtful that superficial vascularization of the cornea, as observed in this study and as found in the general population, should be considered a diagnostic sign of riboflavin deficiency; further controlled investigations along this line should be made."

Dosage of vitamin D, W. Sheldon, C. Harris, N. Morris, and H. Mackay (*Amer. Jour. Diseases Children, 65 (1943), No. 1, pp. 158–161*).—This report of a subcommittee of the British Pediatric Association summarized the various authoritative opinions on vitamin D requirements for infants and children and recommended the following daily allowance for administration under the [British] Government scheme: For full-term infants and children up to 5 yr. old, 700 International Units per day; for premature infants (under 5.5 lb. at birth), from birth to 2 yr., 1,400 I. U. daily; for school children, 3,500 I. U. per week (taking into consideration the small amount of fat, fish, eggs, and meat fat available under wartime conditions); and for pregnant and nursing mothers, 700 I. U. daily, with the provision that this supplement should not do away with the supplement for breast-fed infants. Suggestions, directed primarily to mothers, concerning routine administration of vitamin D are also given.

The relative antirachitic potencies of vitamin D_2 (calciferol from irradiated ergosterol) and of vitamin D_3 (from irradiated 7-dehydrocholesterol),

edited by K. H. Coward (*League Nations Health Organ. Bul., 9 (1940–41), No. 4, pp. 425–435*).—This is a summary of experiments organized prior to September 1939 for the Accessory Food Factors Committee (Lister Institute and Medical Research Council) in preparation for a proposed international vitamin standardization conference. The experiments were carried out collaboratively by workers in nine different laboratories. Separate solutions of vitamins D_2 and D_3 of the same strength, that is, 0.0025 percent in olive oil (wt./vol.) were distributed to the workers who carried out the biological comparisons, using the rat as a test animal, and employing the technics in general use in the respective laboratories. Of the methods used, two were curative, including the X-ray method and the line test technic, and one was prophylactic, employing measurements of the ash content of the bones. Pertinent details of the methods and the results obtained are presented. In the 10 experiments admitting of mathematical calculation of the ratio of the potency of vitamin D_2 to that of vitamin D_3, values varying from 0.9313 to 1.350 were obtained. "The mean of the values weighted according to the number of animals used in each estimation was 0.995. Two other experiments whose results were calculated in a less orthodox manner gave the value for the ratio as approximately 1.0. From inspection of the range of the 12 values obtained, it is safe to conclude that vitamin D_2 and vitamin D_3 have for the rat the same antirachitic potency, i. e., 40,000 expressed in International Units per gram."

International standard for vitamin E (*League Nations Health Organ. Bul., 9 (1940–41), No. 4, pp. 436–442; announced in Analyst, 66 (1941), No. 789, p. 497*).—This report announced the emergency action of the vitamin E subcommittee of the [British] Accessory Food Factors Committee in establishing and recommending for adoption an international standard for vitamin E. The report, presented through the secretary, E. M. Hume, recommended synthetic racemic α-tocopheryl acetate, conforming to stated requirements for chemical and physical constants, for adoption as the international standard. The unit recommended was defined as the specific activity of 1 mg. of the standard preparation, this quantity being the average amount which, when administered orally, prevents resorption gestation in rats deprived of vitamin E. It was further recommended that the standard preparation be issued in the form of a solution in pure olive oil, the solution being of such strength that 10 International Units (10 mg.) be contained in 1 gm. These recommendations were based on the results obtained by experienced workers in 13 of the 17 laboratories that cooperated (prior to 1939) in the study of *dl*-α-tocopheryl acetate as a possible international standard. Four solutions of the tocopheryl acetate of graded strength were tested to determine the relation between dosage and response, the response used being the fertility rate defined as the percentage of positively mated female rats which produced a litter. The results of these tests are briefly presented and discussed.

TEXTILES AND CLOTHING

Textiles feel the impact of war, E. L. Phelps (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 2, pp. 13–14, illus. 1*).—Some of the reasons for the relative shortage of cotton and rayon fabrics and relative adequacy of wool on the civilian consumer market are discussed briefly. The availability of blended fabrics and their usefulness and limitations and the possibilities offered by synthetic fibers and fabrics in the post-war period are also considered. A point-by-point wartime textiles and clothing program for civilians is outlined.

Properties of clothing fabrics (*Textile Res., 13 (1943), No. 14, pp. 21–26*).—This is a brief review of papers presented in a symposium on the functional properties of clothing fabrics held at the annual (1943) meeting of the Textile

Research Institute, Inc. These papers, summarized briefly, deal with some results of recent research in the utilization of textiles to keep the body warm, comfortable, and dry and include the following: Factors Relating to the Thermal Insulating Value of Fabrics, by H. F. Schiefer (pp. 22–24); Water Vapor Permeability of Fabrics, by L. Fourt (pp. 24–25); and The Problem of Water-Repellent Fabrics, by A. M. Sookne (pp. 25–26).

Structure of the wool fiber as revealed by the electron microscope, C. W. Hock and H. F. McMurdie (*Jour. Res. Natl. Bur. Standards [U. S.], 31 (1943), No. 4, pp. 229–236, illus. 10; also in Amer. Dyestuff Rptr., 32 (1943), No. 21, pp. 433–436, 451–454, illus. 10; abr. in Textile Res., 13 (1943), No. 12, pp. 15–20, illus. 4*).—Specimens of wool fiber small enough for satisfactory examination with the electron microscope, i. e., not more than a few tenths of a micron thick, were prepared by various chemical and physical means which served to liberate cortical and scale cells from the wool fibers. Scales from five different samples of wool mixture examined under the electron microscope at several magnifications appeared to be wedge-shaped, thinnest at the point of attachment to the fiber, where covered by overlapping scale, and thicker at the margin. Unlike the cortical cells, the scales showed little internal organization, although with the highest magnification afforded by the electron microscope (× 16,000) they appeared mottled, with less dense areas scattered throughout the denser regions. The cortical cells, always spindle-shaped, had a striated appearance, due to a fibrous structure, except for a granular nucleus near the center. Only fibrils were observed with the optical microscope, but these in turn were resolved in still finer filaments, or microfibrils, by the electron microscope. Untreated wool exposed to the stream of electrons was immediately changed in structure, the cells appearing to explode. In the optical microscope the bombarded cells looked dark, charred, and distorted. Specimens from wool reduced with thioglycolic acid to break the disulfide cross-linkages and then ethylated to prevent reformation of the linkages showed no evidence of any adverse effect due to the electron bombardment.

A microscopical study of dyed wool, G. L. Royer and C. Maresh (*Amer. Dyestuff Rptr., 32 (1943), No. 8, pp. 181–186, illus. 8*).—Photomicrographs presenting high-magnification longitudinal and cross-sectional views of heavily dyed wool fibers subsequently treated with acid show distinct "specks" throughout the sections. Observations with a polarizing microscope and with sections mounted in liquids with refractive indices approaching that of wool suggest that these specks are voids at the interstices of cells within the wool fiber, with the color deposited on the walls of the voids. The significance of these specks in indicating a cellular structure of wool fiber and in playing an important part in certain types of dyeing is discussed.

Microscopical identification of lanital, Aralac, and soybean fibers, G. L. Royer (*Amer. Dyestuff Rptr., 32 (1943), No. 7, pp. 165–166, illus. 3*).—Photomicrographs of lanital, Aralac, and soybean fibers in reaction with concentrated sulfuric acid showed the characteristic diamond-shaped cleavages that develop under the conditions of the test carried out by placing a drop of the concentrated acid at the edge of the cover glass covering the dry teased fibers. As the acid runs under the slide it wets the individual fibers, as can be followed under the microscope by means of the change in index of refraction at the diffusion front. Just before complete diffusion is reached a narrow strip remains unpenetrated in the center of the fiber. At this time the fiber appears to contract slightly at different places along the sides, and at these places well-formed diamonds appear within the fiber. Shortly thereafter as the acid penetrates to the center of the fiber the diamonds close again to cracks perpendicular to the edges of the fiber and then disappear entirely. The process

must therefore be followed closely under the microscope to observe the phenomenon which is characteristic of lanital, Aralac, and soybean fibers, but which has not been found to occur in cotton, wool, cellulose acetate, Bemberg, Viscose, cisalfa, nylon, silk, solvena, Tubize, or Vinyon.

New developments and uses of nylon, G. P. Hoff (*Rayon Textile Mo., 24 (1943), Nos. 7, pp. 57–58, illus. 1; 8, pp. 53–55, illus. 2*).—This is an account of the discovery and development of nylon fiber, first synthesized from sebacic acid and ethylene glycol as a high polymer and later from adipic acid and hexamethylenediamine, both available from coal tar and coke. First made in the laboratory in 1937 and then carried through pilot-plant developments, it was placed on the market in the fall of 1938 in toothbrushes made with nylon bristles; nylon stockings were first marketed in October 1939. By the close of 1941 technical problems in connection with the weaving of the fiber had been worked out and a suitable nylon fabric was available. These developments, making us independent of silk, were ready for adaptation to wartime uses for parachute fabrics, cord for bomber tires, towing rope for air mail and glider pick-up, paint brush bristles, shoelaces resistant to tropical moisture, mildew, and insect injury, and other war materials.

Post-war diversion of nylon will find it in such outlets as hosiery, knitted and woven underwear, lace and nets and marquisettes, sheer and heavy fabrics for home and industrial uses, sash cords for windows, rust- and corrosion-proof window screens, and nylon plastics. Since nylon is not one substance, but a whole family of compounds, different types may be prepared, each with distinctive properties which make it suitable for one or another application. Ten different types are already being made, and the theoretical number of nylons runs into the thousands.

Resistance of various textile fibers to mildew, N. E. Borlaug (*Rayon Textile Mo., 24 (1943), Nos. 8, pp. 60–62, illus. 1; 9, pp. 93–94, illus. 1*).—Fabrics from various textile fibers in common use for military goods were subjected to (1) soil burial tests involving burial of the fabric for 21 days in soils containing an active microflora and (2) laboratory culture tests in which the test organisms used for inoculating the fabric immersed in a liquid nutrient included the active cellulose destroyers, *Chaetomium globosum*, *Metarrhizium* sp., and *Stachybotrys papyrogena*, and the superficial molds, *Aspergillus niger* and *Penicillium* sp. Cellulose acetate in skeins, both with and without the normal finish applied by the rayon producer, was also subjected to storage for 7 weeks at 80° F. and 80 percent relative humidity. The tests are described and presented with full details, and the results obtained are tabulated. Both the cellulose acetate fabric and the nylon fabric and transparent film were very resistant to attack by the micro-organisms in the soil burial tests; the samples were bright and clear when removed from the soil and rinsed in cold water and, with the exception of one sample, retained from 92 to 96 percent of their original tensile strength. Viscose rayon, cotton, cellophane, and completely saponified (deacetylated) acetate rayon samples were entirely destroyed in the soil burial tests. The susceptibility to attack of the saponified cellulose acetate indicated that the resistance of cellulose acetate is correlated with the ester linkage.

In the laboratory jar tests both the cellulose acetate and the nylon fabrics supported extensive growth of *Stachybotrys*, but were not measurably decreased in tensile strength thereby, although they were badly discolored. These fabrics, however, were highly resistant to the action of the other test organisms. The viscose rayon and the completely saponified acetate rayon supported luxurious growths of the cellulose-destroying organisms and lost in tensile strength in proportion to the amount of growth; cellophane was virtually destroyed by these organisms and cotton supported their growth, although its tensile strength was

only slightly reduced thereby. No fungus growth of any type was observed on the cellulose acetate skeins after 7 weeks' storage, and no change in physical properties occurred in this time.

The high resistance to attack by fungi and bacteria observed in cellulose acetate rayon and nylon indicates their suitability for use under the severe exposure conditions of the Tropics, particularly in light-weight fabrics which are difficult to protect with fungicide treatments.

Tests show effects of water temperature in evaluating the efficiency of water-repellent finishes, H. G. Walz and K. R. Fox (*Textile Res., 13 (1943), No. 10, pp. 11–15, illus. 2*).—The water-repellency tests were carried out by the hydrostatic pressure method. The apparatus employed (illustrated by diagram) was similar to the conventional A. A. T. C. C. or A. S. T. M. equipment except that a thermometer was inserted just over the surface of the test specimen in order to record the water temperature in close proximity to the fabric. In addition, the clamp holding the fabric was redesigned with an air vent to prevent trapping of air between fabric and water. After insertion of the sample the head of water was allowed to build up over it at the rate of 1 cm. per second until three distinct spots indicating leakage appeared. The height of the head of water required to produce leakage was determined for water at different temperatures over a range of from about 15° to 45° C. The results, presented graphically, indicated very little decrease in hydrostatic pressure with increase in temperature for the permanent- or resin-type finish applied to OD cotton poplin. The wax-aluminum salt type of finish applied to the same poplin showed pronounced decrease in pressure rating over the temperature range tested, the decrease between the 15° and 45° limits approximating 25 percent. An 8-oz. cotton fabric coated with a wax-type finish also showed a marked loss in water-repellent qualities with an increase in temperature. These results show the importance of water temperature in evaluating the efficiency of a fabric treated with a water repellent and stress the necessity of including temperature control in specifications for the testing of water repellency of a fabric.

Natural dye substitutes: A bibliography, A. E. Karr (*Amer. Dyestuff Rptr., 32 (1943), No. 11, pp. 241–242*).—The 50 references, many of them to the older literature, are concerned with studies of color-producing plants all over the world. The plants noted have in many cases been used to furnish coloring matters for textiles and could be used for this purpose now in case of emergency or local requirements.

Gold lace for the Navy, J. S. Jacobs (*Textile Res., 13 (1943), No. 9, pp. 2–7, illus. 5*).—This is an account of the successful development of processes for the manufacture of gold lace for the U. S. Navy and the hand-embroidered insignia worn by naval officers. This manufacture is a new industry for the United States, developed of necessity when the advent of the war cut off the only supply of gold lace (braid), the manufacture of which had been held for centuries as a closely guarded trade secret by the French lace manufacturers of Lyons.

Factors influencing thermal transmission of blanket materials, E. Freedman (*Rayon Textile Mo., 24 (1943), Nos. 10, pp. 43–44, illus. 4; 11, pp. 66–67, illus. 7; abs. in Textile Res., 13 (1943), No. 13, pp. 21–22*).—Thermal insulation or warmth tests and air permeability tests were conducted by methods noted on fabrics consisting of lock, twill, crepe, and plain weaves. Two fineness grades of Tennessee wool were used, namely, 50–54s and 56–58s. The data reported by table and chart led to the following conclusions: "(1) The finer the wool, the greater the thermal insulation. (2) The higher the count, the greater the thermal insulation. (3) The plain weave does not provide as much warmth as do the lock, twill, and crepe weaves. (4) Thermal insulation is increased, in general, by successive nappings. Of course, there is a limit to the number of nappings

that can be made without reducing, if not destroying the value of the blanket. (5) In slowly moving air, increased thermal insulation is accompanied by increased air permeability. (6) The warmth of a blanket decreases as the wind velocity increases. (7) As the humidity increases the warmth of a blanket decreases."

A service study of women's full-fashioned hosiery manufactured from four varieties of long staple American cotton, M. B. Hays, R. E. Rogers, and M. C. Boyer. (U. S. D. A.). (*Amer. Dyestuff Rptr., 32 (1943), No. 9, pp. 187–190, 209–211, illus. 1*).—"Four varieties of long staple cotton were spun into yarns, then knit into women's full-fashioned hosiery and subjected to wear and laboratory tests. Pima, S×P, and P×(S×P) American-Egyptian cottons from the U. S. Experiment Station at Sacaton, Ariz., were classed as grade 1, 1$^{1}/_{16}$-in. staple. A commercially produced Coker Wilds cotton was classed as Strict Middling of 1$^{3}/_{8}$-in. staple. The four cottons were spun under controlled conditions into 90/2 and 120/2 combed yarns with a 3.75 Z twist multiplier in the single and 4.25 S twist multiplier in the ply. The yarns were mercerized and gassed, then knit into women's full-fashioned hosiery. The hose were worn by student nurses in a Washington hospital. Samples removed at regular intervals of six periods of wear and laundering were subjected to physical and chemical analyses. The remaining hose were continued in service until worn out.

"The three American-Egyptian cottons produced stronger yarns and hose with higher bursting strength than did the shorter staple Coker Wilds cotton. The fluidity values showed that all four cottons were of good quality chemically. There was no statistically significant difference in the length of service of hose made from any of the four cottons. However, the hose from the Coker Wilds appeared to be the least satisfactory when the numerical values for the length of service, time of first break in the leg portion, and the percentage of hose without breaks in the leg portion at the time of discard are all considered; and the S×P hose probably would be most satisfactory. As evaluated by fluidity there was little difference in chemical deterioration among the four cottons. In the Frazier test for elastic properties, the differences between the four cottons were statistically significant but were not of practical importance. Service produced a significant amount of deterioration in cotton as measured by bursting strength and fluidity. The amount of deterioration was greater during the first 12 periods of wear than during the second half, the twelfth to the twenty-fourth period. The variation attributable to individual wearers is significant when evaluated by the sensitive fluidity test."

The wearing qualities of rayon hose compared with silk and nylon hose, H. M. Fletcher. (Kans. Expt. Sta.) (*Rayon Textile Mo., 24 (1943), Nos. 10, pp. 57–58; 11, pp. 81–82, 83, illus. 5; abs. in No. 9, p. 105, illus. 1*).—When the tests previously noted (E. S. R., 88, p. 866) were extended to rayon, it was found that the nylon hose wore longer than the rayon, and these in turn longer than the silk. The average hours of wear by actual wear tests were 515.6, 305.8, and 154.0, respectively.

Statistical analysis of the bursting-strength data for the control (unworn) hose showed that there was not a significant difference between silk and nylon or silk and rayon in regard to bursting strength at knee, leg, or ankle, but that at each place the bursting strength of nylon was greater than that of rayon. At the heel and the toe the bursting strength of silk hose was greater than that of nylon and this in turn greater than that of rayon. At the welt there was not a significant difference between silk and nylon in bursting strength, but each was much greater than the rayon.

The data for the worn hose showed that nylon and silk were significantly stronger than rayon, but nylon was stronger than silk only at the knee. Several

pairs of the rayon wore out in the heels and toes, but the rayon did not snag and run as readily as the silk and nylon. There was no appreciable difference in the fading of the nylon and rayon, but the lesser fading of the silk was probably due to the smaller number of launderings, the silk hose, when worn out by the standards of this test, having been laundered on an average of 12.2 times as compared with 24.2 times for the rayon and 33.5 for the nylon. The load-elongation curves of the hosiery yarns showed that nylon had the greatest stretch when the load was applied and the greatest recovery from the stretch when the load was released.

On a 15-hour-day basis the rayon hose cost 5.3 cts. per day as compared with 10.1 cts. for the silk and 3.9 cts. for the nylon.

Cooperative studies on a laboratory method for evaluating synthetic detergents, J. B. Crowe (*Amer. Dyestuff Rptr., 32 (1943), No. 11, pp. 237–241*).—"Soiled wool and cotton fabrics were used for evaluating synthetic detergents by members of the A. S. T. M., Section E on Sulfonated Detergents, Subcommittee II on Specifications. These test fabrics were washed in launderometers and graded on photometers. This paper gives a résumé of the conclusions and opinions of the cooperating members, together with brief descriptions of the methods used. Details of a typical procedure used for soiling, washing, and grading cotton and wool are appended."

HOME MANAGEMENT AND EQUIPMENT

What makes a successful farm family, D. Dickins (*Miss. Farm Res. [Mississippi] Sta., 7 (1944), No. 2, pp. 1, 7*).—Using data included in Bulletins 380 (E. S. R., 90, p. 718), and dealing with 928 Farm Security Administration families, it is shown that white farm owner families with above-average household managers had accumulated $838 more than those with below-average household managers. The corresponding difference in the Negro group was $615. In nonowner families the differences were $291 for white and $198 for Negro families. "It would thus seem that better management on the part of the wife is one way for the small-scale farm family to improve its financial standing."

REPORTS AND PROCEEDINGS

Report of the Administrator of Agricultural Research, 1943, E. C. Auchter (*U. S. Dept. Agr., Agr. Res. Admin. Rpt., 1943, pp. 236+*).—This includes not only the report of the Research Administration (pp. 1–10), with a discussion of soil-plant-nutrition relationships, meat-dehydration research, and the high lights of the year's research work, but also the reports of the heads of the Bureaus of Agricultural and Industrial Chemistry (pp. 11–50) noted on page 1, Animal Industry (pp. 51–98), Dairy Industry (pp. 99–122), Entomology and Plant Quarantine (pp. 123–180), Human Nutrition and Home Economics (pp. 181–192), Plant Industry, Soils, and Agricultural Engineering (pp. 193–224) noted in part on page 46, and the Office of Experiment Stations (pp. 225–236). The reports of the several bureaus and this Office are also issued as separates.

Twenty-third Annual Report [of Georgia Coastal Plain Station], 1943, G. H. King (*Georgia Coastal Plain Sta. Bul. 36 (1943), pp. 114, illus. 11*).—In addition to meteorological data and a progress report on tobacco diseases, noted respectively on pages 15 and 43, this report notes progress of work with peanuts, cotton, corn, oats, wheat, rye, soybeans, tobacco, miscellaneous forage and cover crops, pastures and grasses, beef cattle, swine, dairy cattle, sweetpotatoes, tomatoes, watermelons, lima beans, cabbage, other truck crops, soil nematodes, peaches, and other fruits and nuts.

Report of progress [of Maine Station] for year ending June 30, 1943, [F. Griffee et al.] (*Maine Sta. Bul. 420 (1943), pp. 419–586+, illus. 6*).—In

addition to articles abstracted elsewhere in this issue, this report notes progress in studies of fertilizers for potatoes and grassland; potato machinery; palatability of legume forages, sweet corn, cabbage, and kale; breeding work with sweet corn, beans, tomatoes, and apples; variety tests with beans, barley, oats, wheat, and millet; field corn hybrids; apple culture and diseases; blueberry field management; and miscellaneous tests.

Plowshares and swords: The Sixty-fourth Annual Report of the New Jersey State Agricultural Experiment Station and the Fifty-sixth Annual Report of the New Jersey Agricultural College Experiment Station, 1942–43, W. H. MARTIN (*New Jersey Stas. Rpt. 1943, pp. 64, illus. 20*).—This report has been noted from another source (E. S. R., 90, p. 718).

Informe de la Estación Experimental de Puerto Rico, 1942, [A. LEE ET AL.] (*Puerto Rico Sta. Rpt. 1942, Span. ed., pp. 32+*).—A Spanish edition of this report (E. S. R., 90, p. 140).

MISCELLANEOUS

Modern farmers' cyclopedia of agriculture, E. V. WILCOX (*New York: Orange Judd Pub. Co., 1944, pp. 497+, illus. 262*).—This treatise, characterized as "a compendium of farm science and practice on field, garden, fruit and orchard crops, and the care, feeding, and diseases of animals," supersedes Farmer's Cyclopedia of Agriculture (E. S. R., 16, p. 518) and Farmer's Cyclopedia of Livestock (E. S. R., 20, p. 372).

Minnesota Farm and Home Science, [October 15, 1943, and February 15, 1944] (*Minn. Farm and Sci. [Minnesota Sta.], 1 (1943), No. 1, pp. 16, illus. 22; 1 (1944), No. 2, pp. 16, illus. 17*).—In addition to articles noted elsewhere in this issue, these numbers contain the following:

No. 1.—Are We Winning the War Against Bovine Mastitis, by W. L. Boyd and W. E. Petersen (pp. 3–4, 12), outlining the essential steps in preventive measures; Wartime Expansion in the Minnesota Dry Milk Industry, by E. F. Koller (pp. 8–9, 10); and Sulfaguanidine for "Necro" in Swine, by H. C. H. Kernkamp and M. H. Roepke (pp. 14–15).

No. 2.—Pick the Crops That Yield More Feed, by G. A. Pond (pp. 6–7), in which various crops are compared as to acre production of digestible nutrients and protein.

Mississippi Farm Research, [February 1944] (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 2, pp. 8, illus. 6*).—In addition to several articles noted elsewhere in this issue, this number contains Weather Notes for January, by R. Woodburn (p. 1); Buying Fertilizer for Cotton in 1944, by W. B. Andrews (pp. 3–4, 6); The Value of Fertilizer for Oats, by R. Coleman and T. E. Ashley (pp. 5–6); and Installation and Use of Gas-Heated Brooders for Chicks, by H. D. Polk (p. 8).

Bimonthly Bulletin, North Dakota Agricultural Experiment Station, [January 1944] (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 3, pp. 35*).—In addition to three articles noted elsewhere in this issue, this number contains Gleanings From the Annual Report, by H. L. Walster, a series of questions and answers on crop problems (pp. 13–26); Big Farms in North Dakota, by H. L. Walster (p. 33); and North Dakota Farm Prices (as of December 15, 1943), by P. V. Hemphill (pp. 34–35).

Bimonthly Bulletin, Ohio Agricultural Experiment Station, [January–February 1944] [*Ohio Sta. Bimo. Bul. 226 (1944), pp. 77+, illus. 8*).—In addition to several articles noted elsewhere in this issue, this number contains Placing a Value on Silage, by A. E. Perkins, (pp. 3–9); and the usual index numbers of production, prices, and income, by J. I. Falconer (p. 77).

NOTES

Arizona University and Station.—Daniel Webster Working, dean of the College of Agriculture from 1919 to 1922 and director of the station for most of this period, died April 9 in Denver, Colo., in his eighty-second year. A native of Colorado, his early life was spent there as editor of a farm journal, teacher, master of the State Grange, secretary of the State Board of Agriculture, farmer, and county superintendent of schools. In 1907 he became superintendent of agricultural extension in the West Virginia University, and from 1911 to 1919 he was associated with the U. S. Department of Agriculture in its farm management investigations and extension work. He was much interested in agricultural education, economics, and history, and in 1923 was designated as agricultural historian of the Colorado College.

Arkansas University and Station.—The bureau of university research has received a substantial grant of funds from the General Education Board and the Arkansas Economic Council, which, with the regular budget of the bureau, will be used for the study of industries utilizing basic raw materials produced in the State, including agricultural products, forestry products, and minerals. Several colleges and departments in the university will participate in the new research program.

Dr. C. O. Brannen, director of the station and also director of the bureau of university research, has resigned as director of the station, effective June 30, when he will be succeeded by Dr. Walter R. Horlacher, dean of the college and director of the agricultural extension service. Dr. S. R. Johnson, associate professor and associate in animal industry, has been granted military leave beginning April 6. Dr. T. J. Claydon and Tildon Easley, instructors, respectively, in animal industry and agronomy, have resigned, the former to become director of the division of dairy products in the State Health Department and the latter to become associated with a commercial seed breeding company. Recent appointments include Odell Julander, instructor in forestry in the Iowa College, as associate professor of forestry; William A. Faught as instructor in rural economics and sociology; and John W. White as assistant director in charge of the Rice Branch Station vice L. C. Carter, resigned to become general manager of the Arkansas Rice Growers Cooperative Association.

Iowa College and Station.—Alden R. Winter, on leave from Ohio State University, has been appointed research associate professor of poultry husbandry for a study of the bacteriological and pasteurization problems of egg products. Dr. Alfred M. Lucas has resigned as associate professor of zoology to become cytopathologist of the U. S. Regional Poultry Research Laboratory at East Lansing, Mich.

Kansas College and Station.—Franklin L. Parsons, associate professor of agricultural economics and assistant in marketing investigations with fruits and vegetables, has resigned to accept a position with the Federal Reserve Bank at Minneapolis, Minn. Dr. Hazel Fletcher, assistant professor and assistant in textile research, has been granted leave of absence to accept a similar position with the U. S. D. A. Bureau of Human Nutrition and Home Economics. Douglas Chapin has been appointed assistant chemist.

New Hampshire Station.—Recent experiments with squash storage indicate that cuts at harvesttime do not increase spoilage and that bruises are a serious cause of spoilage. Furthermore, storage for a period of 2 weeks in the greenhouse is beneficial.

Two days of storage in a freezer locker destroyed all stages of bean weevil. This treatment did not injure the germination of dry beans.

Calves which received the recommended normal amount of vitamin A had a higher percentage of utilization of both energy and protein than calves on a deficient ration. In one instance the deficient ration was fed for 5 mo., and the animal went totally blind. High dosages of vitamin A supplement failed to restore the sight, but the animal's efficiency of energy and protein utilization was regained in a very short time. This project has now been revised to include blood analysis for the purpose of determining carotene, vitamin A, cholesterol, and ascorbic acid. Ophthalmoscopic observations are also being made periodically to check the progress of deficiency effects.

The horticultural department is accumulating samples of the numerous local varieties of beans. These will be studied with respect to production, disease resistance, cooking qualities, and other characteristics.

The forestry department is attempting to correlate weather variations with the quantity and quality of maple sap. Another proposed study deals with the influence of mixing increasing amounts of subsoil with topsoil upon the fertility requirements and the degree of aggregation and aggregate stability of such mixtures.

Cornell University and Station.—Dr. C. H. Myers, professor of plant breeding and associated with the university since 1912, has retired. Dr. Sanford S. Atwood, a geneticist and plant breeder in the U. S. D. A. Regional Pasture Research Laboratory, has been appointed assistant professor of plant breeding.

Pennsylvania College and Station.—C. E. Myers, plant breeder in the department of horticulture and widely known for his work in the development of improved strains of cabbage, tomatoes, and sweet peppers, retired March 1. On April 1, E. W. Callenbach, professor of poultry husbandry, replaced H. C. Knandel as head of the department of poultry husbandry.

Puerto Rico Federal Station.—Atherton Lee, director from 1934 to 1942 and more recently Chief of the Natural Rubber Division of the War Production Board, has accepted a position with the United Fruit Company in connection with its campaign to promote the introduction of new crops into Central America.

School of Pan American Agriculture.—Announcement has been received that this school, founded and to be maintained by the United Fruit Company, is to be formally opened on Columbus Day, 1944. A provisional opening was made in September 1943, with an enrollment of 74 students selected from Mexico and six of the Central American countries. The opening of the school followed an authorization in 1942 by the National Congress of Honduras of a location within that country. A considerable tract of land was purchased at Zamorano, about 25 miles from Tegucigalpa, the national capital. Buildings are under construction to accommodate a student body which is expected to reach the scheduled maximum of 160 by the fall of 1944. A basically practical course of instruction is projected to run for 3 years, with a fourth year added for students showing proficiency and capacity for specialization. Four hours each day will be devoted to field work, and an equal number to study. No tuition fees are charged, and students are furnished lodging, clothing, board, books, and other necessary equipment without cost. The primary purpose is to supply practical agricultural leadership for the American Tropics.

The director of the school is Dr. Wilson Popenoe, formerly of the U. S. D. A. Bureau of Plant Industry. Other members of the faculty include Alfred F. Butler,

head of the department of agronomy and soils; Dr. H. A. Von Wald, agricultural engineering; and E. A. Rivera, livestock.

Refrigeration Research Foundation.—This foundation is a nonpecuniary corporation, organized under Illinois laws on October 14, 1943. Its support is announced as from "voluntary subscriptions by any corporation, firm, or individual engaged in the preservation of food or other commodities by refrigeration." Its purposes are "(1) to improve the methods of refrigeration for the better preservation of food and other commodities essential to the health and welfare of the American people, (2) to develop and support research in the science and art of refrigeration of food and other commodities through a Nation-wide program of financial grants to established institutions and agencies of research, (3) to establish fellowships in institutions and agencies of research and thereby to aid in the training of competent personnel to give activation and leadership to the refrigeration of commodities essential to the national economy, (4) to establish in the interest of the American people a repository of scientific information relating to the refrigeration of food and other materials, (5) to cooperate with and aid agencies of Federal and State governments, institutions of research, and others in connection with their scientific and educational work involving the refrigeration of food and other products." A minimum requirement of $250,000 to initiate active work has been met, and a number of projects have been received.

The chairman of the board of governors is Dr. S. C. Prescott, Cambridge, Mass. The president of the foundation is R. M. Hagen of the California Consumers Corporation, and the director is H. C. Diehl, Mercantile Building, Berkeley 3, Calif. Among the members of the board representing the public are Dr. Eugene C. Auchter, head of the U. S. D. A. Agricultural Research Administration, and Director W. A. Schoenfeld of the Oregon Experiment Station. There is also a scientific advisory committee of 17 members, among whom are F. W. Allen of the California University and Station; Dr. C. O. Bratley, D. F. Fisher, and W. T. Pentzer of the U. S. Department of Agriculture; Dr. W. L. Mallman of the Michigan College and Station; and Dr. G. F. Stewart of the Iowa College and Station.

American Seeds in Russia.—According to a press release issued by Russian War Relief, Inc., under date of May 5, 1944, more than 4,400,000 lb. of vegetable and field seeds have been shipped by that agency from the United States since January 1, 1943. More than 700,000 lb. of vegetable seed and 2,231,161 lb. of field seeds were direct gifts from American seedsmen, institutions, and farmers, and purchase of the remainder of the seed shipped was made possible by contributions to the National War Fund. Forty percent of the seed sown in the Moscow area was supplied from this source. What is considered a very high rate of purity and germination was noted. It is believed that work with these seeds by a number of experimental stations and individual experimenters in Russia will yield results of wide value. A report from Alexander Perevezentsev, senior agronomist from the Moscow Soviet, states that "we presume that by means of crop breeding and selection we will succeed in obtaining new varieties. Undoubtedly the most valuable of them will in due course recross the ocean to add to the seed varieties of our American friends, who have given us such sterling aid in our time of need."

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE [1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The configuration of starch and the starch-iodine complex, I–IV. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), Nos. 4, pp. 554–558, illus. 3; pp. 558–561, illus. 5; 9, pp. 1707–1710, illus. 1; 11, pp. 2200–2203, illus. 2*).—The optical properties considered in the four papers of this series are reported upon as follows:

I. *The dichroism of flow of starch-iodine solutions*, R. E. Rundle and R. R. Baldwin.—In the starch-iodine solutions studied, light with its electric vector parallel to the flow lines was more strongly absorbed than light with its electric vector normal to the flow lines. This dichroism of flow is shown to require that the long axes of the iodine molecules in the complex be parallel to the long axis of the starch-iodine complex. Two structures of the complex fulfill this requirement, including a helical model diagrammatically shown. The dichroism of flow exhibited by various starches and starch fractions in held to be in agreement with the straight-chain, branched-chain model for the two components of starch.

Study of the dichroism of flow is proposed as a method for the determination of the axial ratios of the starch-iodine complex.

II. *Optical properties of crystalline starch fractions*, R. E. Rundle and D. French.—Platelets of a crystalline amylose were found optically negative, probably uniaxial. After staining with iodine they are highly dichroic. Light with its electric vector in the plane of the platelet was weakly absorbed; light with its electric vector normal to the plane of the platelet, strongly absorbed. The birefringence of the crystalline material from a butanol fractionation of starch was examined, together with its dichroism after staining with iodine. This material appeared to be a multiple of crystalline amylose platelets with the normals to the platelets all in one plane. The optical properties of these solutions are interpreted in terms of a helical starch chain. The starch-iodine complex probably has the structure indicated in paper I. A structure, proposed as probably that of crystalline amylose, is shown.

[1] The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

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III. *X-ray diffraction studies of the starch-iodine complex*, R. E. Rundle and D. French.—The amylose-iodine complex was shown to have a hexagonal unit cell, a_0=12.97, c_0=7.91, d_{100}=11.23 a. u. The unit cell confirms dimensions of this helical structure for the starch-iodine complex, 12.97 a. u. being the diameter of the helix, 7.91 a. u. the length of a turn in the helix.

The starch-iodine complex can be prepared entirely without water or iodide ion if the starch is first put in the "V" configuration by alcohol precipitation. Starch in the V configuration will absorb iodine vapor in quantity, while in the "A" and "B" configuration it will not. Amylose in the V configuration will absorb 26 percent of its own weight in iodine. This corresponds to one iodine for six glucose residues, "but it is not established that this is the maximum iodine absorption."

IV. *An X-ray diffraction investigation of butanol-precipitated amylose*, R. E. Rundle and F. C. Edwards.—Paper IV reports upon diffraction patterns from wet and dried butanol-precipitated amylose which are held to confirm structural deduction of a helical starch chain with a helix diameter of about 13.7 a. u., a length per turn of about 8 a. u., and six glucose residues per turn. The helices approximate a close-packed arrangement in both the wet and dried precipitates, with alternate helices directed oppositely. The space group for both structures is probably D_2^4–$I'2_12_12_1$. The special relations between the starch-iodine complex and the dried butanol precipitate confirm the postulate that in the starch-iodine complex the iodines occupy the interior of the helices, and it is suggested that in butanol-precipitated amylose the butanol occupies the interior of the helix. The cell previously reported as that of the starch-iodine complex[2c] "must be a pseudo cell with only pseudo hexagonal symmetry."

Solution viscosities of the amylose components of starch, J. F. Foster and R. M. Hixon. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 4, pp. 618–622, illus. 3*).—The viscosity-concentration relationships in ethylenediamine solutions of the amylose components from various starches added to the evidence indicating that the amyloses are linear polymers. The viscosity limits fall in an order inverse to that of the potentials at which the amyloses take up iodine from solution, confirming the postulate that this potential is a function of the molecular weight of the amylose. Synthetic starch was found anomalous with respect both to its iodine titration curve and to the viscosity-concentration relationship of its solutions. "The former anomaly can perhaps be best explained on the basis of heterogeneity. The latter indicates increased polymer-polymer interaction which cannot be explained by heterogeneity but may be due to the presence of polar groups in the molecule, perhaps phosphate groups." The viscosity limits of the corn amyloses prepared by different methods were found to be in the order expected from the methods of preparation.

The molecular constitution of amylose and amylopectin of potato starch, W. Z. Hassid and R. M. McCready. (Univ. Calif.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, pp. 1157–1161, illus. 1*).—Potato starch was found to consist of two distinct fractions, amylose (approximately 20 percent) and amylopectin, which differ in their physical properties, molecular constitution, and behavior toward β-amylase.

On hydrolysis of the methylated amylose, followed by a quantitative separation of the cleavage products, 0.32 percent tetramethylglucose (end group) was obtained. This proportion of end group corresponds to a chain length of approximately 350 glucose units. It is, therefore, concluded that the amylose is made up of long nonbranched chains of glucopyranose units (300 to 400) joined by α-glucosidic linkages between the first and fourth carbon atoms. The methylated amylopectin yielded on hydrolysis 4.67 percent tetramethylglucose (end group) which corresponds to a repeating chain length of 25 glucose units. These

relatively short chains are believed to be combined to form a branched structure. The difference in behavior of β-amylase toward amylose and amylopectin is held to be in accord with the differences in their chemical constitutions.

The separation and quantitative estimation of amylose and amylopectin in potato starch, R. M. McCready and W. Z. Hassid. (Univ. Calif.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, pp. 1154–1157, illus. 1*).—The amylose fraction was separated by heating a dilute starch paste at 60° [C.], with slow stirring, for 4 hr., and precipitating the dissolved substance from the clear centrifugate by adding methyl alcohol sufficient to bring the concentration to 20 percent. The residue not dissolved in this procedure was electrodialyzed in 1-percent aqueous solution. After a second treatment of this sort the precipitate deposited on the membrane nearest the anode was collected, dehydrated with alcohol, and dried as before. A preparation thus treated, according to the criteria here described, consists of pure amylopectin. The amylose, after drying, is almost insoluble in water, completely hydrolyzed with β-amylase to maltose, and gives a brilliant blue color when treated with iodine. Enzymatically synthesized potato starch resembles the amylose fraction of starch in all its properties. A quantitative method based on the color reaction with iodine, for estimation of the relative proportion of amylose and amylopectin in mixtures, or in unfractionated potato starch is described.

Orientation in stretched films of amylose triacetate, R. L. Whistler and N. C. Schieltz. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 7, pp. 1436–1437, illus. 1*).—Confirmatory evidence that stretching produces orientation in these acetate films has been obtained by X-ray analysis. X-ray diffraction patterns taken during the stretching of films indicated a progressive change from an amorphous to a highly crystalline condition. Films stretched in hot water readily set to the new length when cooled and could be handled easily in the elongated state. When elongated 400–600 percent the films produced a typical fiber pattern on exposure to X-rays. The presence of discrete spots in the diffraction pattern is proof of the high degree of orientation attained by the film molecules and is further evidence that the molecules possess a linear nature. This is the first time a fiber pattern has been obtained with starch or its derivatives. Identical diffraction patterns were obtained from stretched acetate films prepared from either fractionated corn or potato starches. In each case a periodicity of 18.3 a. u. occurred along the fiber (b) axis.

The action of macerans amylase on the fractions from starch, E. J. Wilson, Jr., T. J. Schoch, and C. S. Hudson (*Jour. Amer. Chem. Soc., 65 (1943), No. 7, pp. 1380–1383, illus. 1*).—The authors found that selective precipitation of starch sols with mixed *n*-butyl and isoamyl alcohols permits separation of the fractions by low-speed centrifuging. With *macerans* amylase the precipitated fractions from corn and potato starches gave high yields of Schardinger dextrins and minor amounts of noncrystalline limit dextrins. In contrast, the nonprecipitated fractions gave less Schardinger dextrins and more limit dextrins than do the parent whole starches. The behavior of waxy maize starch was similar to that of the nonprecipitated fractions from corn and potato starches. The alkali lability of a starch digest increased during *macerans* enzymolysis. The Schardinger α- and β-dextrins were stable toward alkali, while the limit dextrins are alkali labile.

Any insoluble precipitate (γ-amylose) resulting from *macerans* conversion of cornstarch is attributed to the presence of fatty material and to incomplete dispersion of the starch. Under proper conditions, the quantity of such insoluble material is negligible.

An amylase inhibitor from certain cereals, E. Kneen and R. M. Sandstedt. (Univ. Nebr.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, p. 1247*).—The

authors find that wheat grain contains a water-soluble, proteinlike substance which has a powerful inhibitory action on salivary, pancreatic, and most bacterial amylases. The substance inhibits the action of these enzymes both on gelatinized and native (raw) starch. No inhibition was observed with two commercial amylase preparations, supposedly of bacterial origin, nor with fungal or cereal malt amylases. The sensitive amylases varied in their response; under comparable conditions equal amounts of the inhibitor gave reductions in starch dextrinization rates of 82 percent for salivary amylase, 48 percent for bacterial amylase, and 23 percent for pancreatic amylase. The inhibiting substance is soluble in water and in dilute salt and dilute ethanol solutions but insoluble in petroleum ether. High levels of ammonium sulfate or of ethanol give precipitates that are active when redissolved in water. The substance is retained by a cellophane dialysis membrane. In water solution it is quite thermostable, being little affected by temperatures up to 90° [C.]. However, autoclaving for 30 min. at 15 lb. pressure causes complete loss of inhibiting properties.

New methods for the purification of invertase and some properties of the resulting products, M. Adams and C. S. Hudson (*Jour. Amer. Chem. Soc., 65 (1943), No. 7, pp. 1359–1368, illus. 2*).—Purification procedures of three types are described. The first, which makes use of adsorption upon bentonite, proved applicable to yeast from six different sources. The method is relatively simple and as effective as more involved procedures which include enrichment of the yeast or fractional adsorption. Preparations of practically constant time values were produced, in spite of a nineteenfold variation in the invertase content of the starting materials.

In solutions prepared under the conditions described, the invertase exhibited amphoteric properties which made possible its purification of precipitation with both acid and base precipitants. Methods have been developed for the purification of this enzyme by the use of picric, picrolonic, flavianic, and nucleic acids, Reinecke salt, ammonium rhodanilate, cupric acetate, and uranyl acetate. In general, the base precipitants proved more satisfactory than the acid precipitants, and the maximal purification produced by these reagents was approximately the same as that resulting from the use of bentonite. These precipitants proved particularly useful when highly concentrated solutions of invertase were desired. Purified products similar to those obtained by adsorption or by precipitation resulted also from the use of a third type of procedure based upon the insolubility of invertase in saturated ammonium sulfate solutions.

The isolation of β-amyrin from the leaves and seeds of alfalfa, L. C. King, C. D. Ball, B. Riegel, C. E. Schweitzer, P. G. Smith, and E. W. Meyer. (Mich. State Col. et al.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, pp. 1168–1170*).—β-Amyrin was isolated from the unsaponifiable fraction of alfalfa seed oil (Hardigan) and from alfalfa leaf meal oil. It was characterized by its acetate, benzoate, and *p*-nitrobenzoate.

Preparation of d-galacturonic acid from pectin, E. Rietz and W. D. Maclay. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, p. 1242*).—A number of commercial pectins were used, and yields of *d*-galacturonic acid ranging from 74 to 80 percent, based on the uronic anhydride content of the pectin, were found readily obtainable. Included among starting materials used were 285- and 300-grade apple pectins and 170-, 185-, and 200-grade citrus pectins.

Pyrolysis of lactic acid derivatives: Preparation of allyl and methallyl acrylates, C. H. Fisher, C. E. Rehberg, and L. T. Smith. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 5, pp. 763–767*).—Allyl and methallyl lactates were prepared by direct esterification of lactic acid with the alcohols and by alcoholysis of polylactyllactic acid. Allyl and methallyl acetoxypropionates were prepared from the corresponding lactates by acetylation with acetic anhy-

dride. Allyl and methallyl acrylates were obtained in moderate yields in the pyrolysis of the corresponding acetoxypropionates. These acrylic esters can be used to prepare polymers and interpolymers which, by virtue of cross-linkages, are less soluble, less fusible, and harder than polymers obtained by polymerizing methyl acrylate or vinyl acetate alone.

Preparation of allyl and methallyl methacrylates by the thermal decomposition of allyl and methallyl α-acetoxyisobutyrates, C. E. Rehberg, C. H. Fisher and L. T. Smith. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, pp. 1003–1006*).—Methods for preparing allyl and methallyl α-hydroxyisobutyrates from hydroxyisobutyric acid and the appropriate alcohol were developed. The hydroxy esters were converted into allyl and methallyl α-acetoxyisobutyrates by treatment with acetic anhydride.

Under conditions milder than those required for the thermal decomposition of the corresponding acetoxypropionates, allyl and methallyl acetoxyisobutyrates were transformed successfully by pyrolysis into allyl and methallyl methacrylates.

The production of acetylmethylcarbinol by the action of Acetobacter suboxydans upon 2,3-butylene glycol, E. I. Fulmer, L. A. Underkofler, and A. C. Bantz. (Iowa State Col.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 7, pp. 1425–1427*).—The authors describe a procedure for the production of acetylmethylcarbinol by the action of *A. suboxydans* upon 2,3-butylene glycol. The yields of the carbinol were 90–94 percent of theory. The unfermented 2,3-butylene glycol was found dextrorotatory with an angle of rotation much higher than that previously reported. These results indicate that the organism attacks the mesoglycol preferentially, and that the glycol produced by the action of *Aerobacter aerogenes* consists of the mesoglycol and *d*-glycol with little or none of the *l*-glycol.

Trimolecular acetone peroxide in isopropyl ether, F. Acree, Jr., and H. L. Haller. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 8, p. 1652*).—The authors report a separation from old isopropyl ether (at least 5 yr. in clear glass bottles in the laboratory) of crystals having the appearance of common salt, melting point 94° [C.] (98° after recrystallization), molecular weight of 221 as indicated by Clark's form of the Signer method (E. S. R., 87, p. 171), all the known properties of trimolecular acetone peroxide, and an unaltered mixture melting point when melted with a known sample of the acetone derivative. This substance was obtained in crystalline form from four out of five lots of isopropyl ether when the solvent was evaporated to one-third its original volume. The peroxide exploded on percussion or when heated on a platinum spatula, and may be responsible for the reported explosions of isopropyl ether.

Xanthone 2,7-dinitrile, H. J. Fisher. (Conn. [New Haven] Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 5, p. 991*).—This compound was obtained in 48-percent yield by a Sandmeyer reaction from the corresponding diamino compound. The dinitrile was almost completely insoluble in all the common solvents, but could be sublimed under diminished pressure or recrystallized from benzonitrile. It sublimed as bright yellow crystals, recrystallized as a cream-colored microcrystalline powder, and gave a colorless solution with strong blue fluorescence in concentrated sulfuric acid.

The absorption of light by 1,5-dien-3-ynes in the region 2300–2900 Å, H. Bastron, R. E. Davis, and L. W. Butz. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 5, pp. 973–975, illus. 7*).—Ultraviolet absorption curves for seven 1,5-dien-3-ynes are recorded, and a regularity in the position of the chief maximum relative to the number of rings contained in the dienyne system is noted.

The reaction of formaldehyde with l(+)-aspartic and l(+)-glutamic acids, D. C. Carpenter and F. E. Lovelace. (N. Y. State Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, pp. 1161–1165, illus. 3*).—The reactions between solutions of *l*(+)-aspartic and *l*(+)-glutamic acid containing two equivalents of sodium hydroxide and various proportions of formaldehyde were followed by polariscopic and H-ion measurements. It was shown that each of these amino acids reacts with formaldehyde, mole per mole, to form definite compounds. Each of these latter compounds combines with further quantities of formaldehyde when the aldehyde concentration is increased, giving unstable compounds that cannot be isolated. The equilibrium constants of the above observed reactions were derived from recorded experimental data.

Cis-trans isomerization and spectral characteristics of carotenoids and some related compounds, L. Zechmeister and A. Polgár (*Jour. Amer. Chem. Soc., 65 (1943), No. 8, pp. 1522–1528, illus. 8*).—Although the wave lengths and intensities of the main maxima of carotenoids are decreased by trans-cis shifts when a hexane solution is refluxed or catalyzed with iodine, there develops between 320 and 380 mμ, a new marked maximum, of which the absolute position in the spectral curve depends on the structure of the chromophoric system. Its distance from the highest wave length maximum of an all-trans C_{40}-carotenoid is practically constant (142 mμ). Methylbixin and diphenyloctatetraene show qualitatively the same phenomenon. On addition of some iodine, vitamin A shows an increase of its extinction in the region 240–280 mμ.

Action of cold concentrated hydriodic acid on carotenes: Structure and cis-trans-isomerization of some reaction products, A. Polgár and L. Zechmeister (*Jour. Amer. Chem. Soc., 65 (1943), No. 8, pp. 1528–1534, illus. 2*).—When petroleum ether solutions of α- or β-carotene are shaken with cold, commercial concentrated hydriodic acid, a subsequent chromatogram shows no unchanged starting material but smaller quantities of new pigments, two of which were crystallized and were characterized as 5,6-dihydro-β-carotene and 5,6-dihydro-α-carotene.

Spectral characteristics and configuration of some stereoisomeric carotenoids including prolycopene and pro-γ-carotene, L. Zechmeister, A. L. LeRosen, W. A. Schroeder, A. Polgár, and L. Pauling (*Jour. Amer. Chem. Soc., 65 (1943), No. 10, pp. 1940–1951, illus. 11*).—In the work here reported the authors made a further use of the absorption maximum in the ultraviolet indicated in the papers above noted. Both prolycopene and pro-γ-carotene were observed to undergo stereoisomerization on insolation.

The effect of oxygen on the fluorescence of certain hydrocarbons, J. A. Miller and C. A. Baumann. (Wis. Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 8, pp. 1540–1546, illus. 2*).—The authors measured the intensity of fluorescence of 3,4-benzpyrene, 20-methylcholanthrene, 9,10-dimethyl-1-2-benzanthracene, 1,2,5,6-dibenzanthracene, 1,2-benzanthracene, and anthracene, each in several solvents, in air and in vacuo. In air the intensities usually ranged from one-half to one-sixth of those observed in the absence of all gas but solvent vapor. Most of the difference was shown to be due to dissolved oxygen, although in some cases the degree of quenching did not parallel oxygen solubility. In the presence of oxygen the fluorescence bands of benzpyrene were diminished in intensity, but both the fluorescence and absorption spectra of benzpyrene were qualitatively the same in air and in vacuo. The fluorescence intensities of the hydrocarbons varied hyperbolically with the partial pressure of oxygen. Identical equations relating these two quantities were derived on the alternate assumptions that a nonfluorescent dissociate complex between oxygen and the hydrocarbon was formed, or that the quenching of fluorescence by oxygen was a collision phenomenon. Observed values agreed well with

calculated values from the derived equations. The fluorescence of the nonsaponifiable matter from mouse tissue did not vary greatly with P_{O_2} either in petroleum ether or in pyridine.

Sulfur dioxide was many times as effective an inhibitor of fluorescence as oxygen; hydrogen chloride and trimethylamine were less effective. The inhibition was reversible by changing the partial pressure of the gas. Sulfur, nitrobenzene, and tetranitromethane inhibited the fluorescence of benzpyrene solutions both in air and in vacuo. This inhibition could be reversed by passing the quenched solution through a column of aluminum oxide. Nitrogen, hydrogen, carbon dioxide, hydrogen sulfide, methylamine, and ammonia did not affect the intensity of fluorescence of benzpyrene.

Molecular weight of the adrenocorticotropic hormone, E. Burtner. (Univ. Wis.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, p. 1238, illus. 1*).—Diffusion and sedimentation experiments performed with dilute solutions of the hormone gave the molecular weight as 20,000±10 percent. Sedimentation and diffusion constants are also stated.

The formation of ergostatetraene-B during the acetylation of ergosterol, H. A. Stansbury, Jr. (*Jour. Amer. Chem. Soc., 65 (1943), No. 6, p. 1243*).—Frequently the acetylation of ergosterol by means of boiling acetic anhydride gives an unsatisfactory yield of ergosteryl acetate, and the physical properties of the crude product indicate the presence of a low-melting byproduct of positive optical rotation. This byproduct has now been shown to be ergostatetraene-B, formed by the dehydration of ergosterol.

Polymorphism of phosphoric oxide, W. L. Hill, G. T. Faust, and S. B. Hendricks. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 5, pp. 794–802, illus. 6*).—The melting points and monotropic relationship of three crystalline forms of phosphoric oxide were determined by the method of quenching. Previous vapor pressure data are discussed and interpreted to establish a pressure-temperature diagram (70°–600° [C.]) for the one-component system.

The system was shown to involve three triple points at which solid, liquid, and vapor (P_4O_{10}) coexist in equilibrium, namely: 420° and 360 cm., 562° and 43.7 cm., and 580° and 55.5 cm., corresponding to the hexagonal, orthorhombic, and stable polymorphs, respectively, and at least two distinct liquids, one a stable polymer of the other, which were identified with the melting of the stable form and of the hexagonal modification, respectively. Indices of refraction of the polymorphs and glasses were determined. The density and the thermal, hygroscopic, and structural properties of the several phases are discussed.

[Investigations in bacteriological chemistry] (*Wisconsin Sta. Bul. 461 (1943), pp. 42–43*).—Increased quantities of butylene glycol, which yields more and purer butadiene than does ethyl alcohol, have been obtained by a "slow feed" procedure in adding the fermentable sugar. The higher concentrations of butylene glycol make its recovery more economical. Both bacterial and mold cultures can be used as sources of the amylase for breaking down starch into fermentable sugars for production of the glycol. Strains of glycol-producing bacteria immune to bacteriophage have been found.

Citric acid fermentation by molds (a special strain of *Aspergillus niger*) was applied under suitable conditions to beet molasses instead of pure sugar.

An American-made substitute for agar was found to be better than agar itself for legume bacterial cultures in that it is readily soluble in water and the bacteria need not be washed from the jelly. When the jelly is dissolved all the bacteria will be carried with it onto the seed.

A method for indicating the moisture content of food during dehydration, G. Bouyoucos and H. A. Cardinell. (Mich. Expt. Sta.). (*Science, 98 (1943), No. 2550, pp. 435–436, illus. 1*).—The method outlined briefly in this preliminary

report makes use of the fact that evaporation of water from the material being dehydrated lowers its temperature below that of the surrounding dehydration chamber. Two thermometers are used, one, with the bulb uncovered, suspended in the drying chamber; and the other, with the bulb covered with a definite amount of the dehydrating material contained in a small cheesecloth bag, placed on one of the loaded drying trays. As the dehydration proceeds, the material becomes progressively drier and its temperature progressively higher, until finally both temperatures come close together. Specially devised sensitive resistance thermometers, using a liquid rather than metal for the resistor, are used, and the electrical resistance values are read on a special Wheatstone bridge. The wire leads may be of any length permitting temperatures to be read from the outside of the dehydrator. A chart plotting resistance against dehydration time in the case of cabbage shows that by calibration it is possible to know during the dehydration when the material has reached the desired moisture content. The method is reported to have been successfully applied to various materials.

Steam distillation: A new procedure for the determination of carbonate CO_2, W. M. SHAW and W. H. MACINTIRE. (Tenn. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 357–396, illus. 2*).—The authors found that dilute perchloric and hydrochloric acids can be used to equal advantage, but a scrubber bulb is essential when hydrochloric acid is used.

To minimize CO_2 from decomposition of soil organic matter, it is essential to include an antioxidant in the hydrochloric acid digestant. In general, stannous ferrous chloride proved to be an antioxidant more suitable than ferrous chloride.

Most acidic soils yielded from 0.003 to 0.01 percent of CO_2 by steam distillation. Higher values were obtained from soils of the Podzol type and from peat. Much of this CO_2 is attributed to inorganic sources. During hydrochloric acid digestion of red clay, virtually devoid of organic matter, 0.005 percent of CO_2 was evolved.

The differences between analytical results by the proposed steam digestion and those by the Schollenberger procedure (E. S. R., 65, p. 504) are stated to be usually well within 0.010 percent of CO_2 for surface soils. Although not entirely eliminated, the error attributable to the decomposition of organic matter is believed negligible. Because of its precision and rapidity, the steam distillation procedure is proposed for the determination of soil carbonates.

Differential action of permanganate and ceric sulfate on cuprous oxide prepared in presence of iodide, J. T. SULLIVAN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 428–429*).—In the titration of ordinary cuprous oxide, results close to the theoretical were obtained with both permanganate and ceric sulfate. In the titration of cuprous oxide prepared in the presence of iodide, permanganate gave about 6 percent higher results than did ceric sulfate.

Analysis and stability of zinc phosphide, J. W. ELMORE and F. J. ROTH (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 4, pp. 559–564, illus. 1*).—The phosphide is decomposed by treatment with hydrochloric acid in a suitable aeration arrangement, and the gas is oxidized to phosphoric acid by aerating it into potassium permanganate solution.

Experiments on the stability of zinc phosphide showed that this substance could be stored in burlap bags for at least 180 days without detectable change in composition. Under field conditions, more or less rapid loss of phosphide content took place, however.

A microbiological assay method for p-aminobenzoic acid, R. C. THOMPSON, E. R. ISBELL, and H. K. MITCHELL (*Jour. Biol. Chem., 148 (1943), No. 2, pp. 281–287, illus. 1*).—The organism used for this test is a mutant strain of *Neurospora crassa* produced by Tatum and Beadle (E. S. R., 88, p. 180) and

requiring *p*-aminobenzoic acid. The agar assay medium used contains inorganic salts, ammonium tartrate, sucrose, biotin, and supplements of specially prepared natural extracts of casein, beef liver and muscle, and yeast. This medium, supplemented with *p*-aminobenzoic acid, is used for carrying the stock cultures and for preparing the inoculum. The latter is obtained by inoculating the cooled sterile supplemented basal medium with spores of the mold, pouring into Petri dishes of uniform depth, and incubating. Sterile blocks of agar, cut with a cork borer from this incubated plate containing a uniform suspension of the incipient mycelia, are used for inoculating test and standard plates poured from the sterile mixture of assay medium and test substances or standard. The inoculum block is placed upon the surface in the center of each cooled plate and incubated right side up at 30° C. for approximately 20 hr. Standard plates containing amounts of *p*-aminobenzoic acid varying from 4 to 40 mμg (10^{-9} gm.) are satisfactory for establishing a standard curve. Amounts of the extracts to be assayed are selected to contain an amount of *p*-aminobenzoic acid within the range of the standard curve. The diameter of the mold growth surrounding the inoculum block is measured with calipers and is dependent on the amount of *p*-aminobenzoic acid in the culture plate. Materials are prepared for assay by hydrolysis with 6 N H_2SO_4 which produces maximum liberation of the *p*-aminobenzoic acid, although at the same time there is approximately a 15 percent destruction of the amount liberated. The response of the mold is specific to the *p*-aminobenzoic acid content of the samples being assayed; of the derivatives tested, only the amide possessed appreciable activity, being three-hundredths as active as *p*-aminobenzoic acid. The *p*-aminobenzoic acid content, both bound and unbound, of a number of natural materials was determined. In the animal materials tested the percentages of bound *p*-aminobenzoic acid was high, ranging from 53 to 79.9 percent; 10 miscellaneous materials, mostly of plant origin, averaged 44 percent bound.

Determination of p-aminobenzoic acid, E. R. Kirch and O. Bergeim (*Jour. Biol. Chem., 148 (1943), No. 2, pp. 445–450, illus. 1*).—The method, presented in detail as to reagents and procedure, is based upon the color reaction of diazotized thiamine with *p*-aminobenzoic acid and separation of the colored compound taken up in amyl alcohol from the solution adjusted to a pH of approximately 5.3. The color is read in a spectrophotometer or other suitable instrument and the reading compared with a standard reference curve established with known quantities of the acid. The reaction is specific, and about 10γ of the *p*-aminobenzoic acid is the smallest amount to give a color under conditions of the test. The application of the method to studies of excretion of free and conjugated *p*-aminobenzoic acid in urine is discussed.

Note on the determination of "citrin" in lemon preparations, A. E. Goldfarb, E. Bueding, and P. Karp (*Jour. Lab. and Clin. Med., 28 (1943), No. 8, pp. 1036–1037*).—In order to eliminate the interfering brown coloration due to the action of hot alkali on sugar, the method of Lorenz and Arnold (E. S. R., 87, p. 482) for the determination of citrin in lemon juice was modified by avoiding heating of the solutions after the addition of alkali. The modified method as described involved dilution of the lemon juice or the water extract of lemon peel with an equal volume of 95 percent alcohol, followed by filtration and dilution of the filtrate with 50 percent alcohol until the color intensity came within the optimum range of standard eriodictin solutions (0.04–0.2 mg. per cubic centimeter); for lemon peel extract a dilution of 1:100 usually sufficed, and for lemon juice a dilution of 1:20. To 9.2 cc. of this dilution was added 0.8 cc. of 25 percent KOH, and the color was then read in a Klett-Summerson colorimeter, using filter No. 42. A more efficient extraction of citrin from lemon peel was

obtained by extracting in the cold instead of cooking. Lemon juice was found to contain about one-sixth the amount of citrin found in lemon peel extract.

Determination of paradichlorobenzene in soil, R. D. CHISHOLM and L. KOBLITSKY. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 2, pp. 273–277, illus. 1*).—A method is presented for the determination of paradichlorobenzene in soil mixtures. The method consists in the removal of paradichlorobenzene from the mixture by steam distillation, its recovery in highly refined kerosene, and the determination of the difference between the refractive index of the solution and that of the kerosene. The relationship between the refractive-index difference and the weight of paradichlorobenzene in soil mixtures may be expressed by a linear regression formula. The method was applied to the determination of paradichlorobenzene in soil mixtures used in the treatment of nursery plants. The mean difference in duplicate analyses was about ¼ lb. of paradichlorobenzene per cubic yard. It is suggested that this method may find application in the determination of such other volatile compounds as naphthalene or betanaphthol.

Ash determinations in foods with an alkaline balance.—V, Reactions of alkali carbonates with calcium phosphates, H. J. WICHMANN (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 4, pp. 522–559, illus. 18*).—It is shown in an extension of the author's previous investigations on this subject (E. S. R., 89, p. 10) that alkali carbonates can react with calcium phosphates in both the wet and dry states to form a number of compounds, of which the composition is governed principally by the carbonate: phosphate ratio and the temperature of ashing. The weight of the residue or total ash varies correspondingly to some degree. The composition of the ash, particularly of the insoluble ash, is more definitely influenced by these factors than is the weight of the total ash, however. Soluble phosphates are produced in quantities which vary with the type of reaction and temperature. The greatest changes produced are those in the insoluble ash, which always contains sodium if sodium carbonate is one of the reactants. The insoluble ash may, or may not, contain potassium in analogous potassium carbonate reactions. If the carbonate : phosphate ratio is low (hardly more than that required for neutralization of acid calcium phosphates) the insoluble ash consists of insoluble double calcium-alkali phosphates, carbon dioxide-containing double phosphates, or mixtures of these. These carbonated double phosphates do not lose carbon dioxide appreciably up to 800° C. Increase of the carbonate: phosphate ratio, as well as increase of temperature, tends progressively to force the reaction away from the double phosphate towards the hydroxyapatite equilibrium, with resulting decreases in the water-insoluble alkalies. Hydroxyapatites produced with sodium carbonate always contain sodium within the framework of the molecule, but potassium-containing hydroxyapatites are less stable. The hydroxyapatites produced at ashing temperatures always contain some carbon dioxide. The carbonated hydroxyapatites, when more or less isolated as insoluble ash, lose carbon dioxide gradually at any temperature between 500° and 800°. When either sodium or potassium enters the hydroxyapatite molecule, equivalent calcium carbonate is set free and appears mixed with the hydroxyapatite in the insoluble ash. This calcium carbonate is sharply decomposed between 600° and 700°. When carbonated hydroxyapatite and calcium carbonate are heated together, the residues at increasing temperatures exhibit a decomposition curve less abrupt between 600° and 700° than with calcium carbonate alone. Excess alkali carbonate and high temperature (800°) in turn will decompose hydroxyapatites and cause more phosphorus to become water-soluble.

Rapid modification of A. O. A. C. chloroplatinate method for determination of potassium in fruit products, C. A. WOOD. (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 472–476*).—The author finds that the oxalate treat-

ment and subsequent removal of ammonium salts, although possibly necessary in certain more complex products, may be dispensed with in the case of the ash obtained from fruits and preserves. The modified method requires considerably less working time and analytical manipulation than does the A. O. A. C. method. Check analyses between the two methods indicate good agreement. A volumetric procedure for determination of the potassium chloroplatinate thus obtained is also suggested.

Chlorine in ash of fruit products, R. A. OSBORN (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 437–440*).—It was found expedient to use sodium carbonate as a chlorine fixative during ashing for fruits and fruit products in all instances where the quantity of chloride in the sample is material.

The polybasic acids of fruits and fruit products, B. G. HARTMANN (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 444–462*).—The methods here described in working detail comprise removal of pectin, isolation of polybasic acids, and determination of tartaric acid, citric acid (normal), laevo malic acid, inactive malic acid, isocitric acid, and tannin and coloring matter. Methods, for the most part, are more rapid than those now official.

Aids for determining crude fiber, E. J. BENNE. (Mich. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 2, pp. 277–279, illus. 2*).—To handle hot Erlenmeyer flasks in the crude fiber method, a handle was made from maple wood, and clamp jaws were obtained from a universal clamp. The rivet holding the jaws together was removed, and the holes were enlarged to accommodate a No. 6, round-headed wood screw, which was used to fasten the jaws to the handle. The lower end of the wooden part of the handle is curved inward toward the flask, against which it rests at about one-fourth of the height of the flask. The clamp jaws grip the flask at the neck.

To hold the filter cloth from which the fiber is transferred to the digestion flask with boiling alkali solution, and to the Gooch crucible with hot water, an insulated scoop was made from a piece of sheet iron. A block of wood was hollowed out to accommodate the scoop, which was fastened to the block with screws from the inside. The heads of the screws were covered over with solder to make the inner surface of the scoop smooth and prevent the hot liquids from seeping through the wood. The block was then reduced to a convenient size, its small end was shaped to fit the curve in the neck of the digestion flask, and its sides were grooved to provide finger holds. The block was treated with a penetrating wood preservative. The scoop rests securely on a flat surface and does not tip as the filter cloth is fitted into it.

Analysis of stock feeds for calcium, phosphorus, and iron, C. V. MARSHALL, R. B. CARSON, and T. DAVIS (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 429–433*).—The authors describe a method that allows all three determinations in mineral supplements and in feeds to be made on aliquots of one digestion for the determination. Complete recovery of the calcium in calcium sulfate and calcium monophosphate was obtained. Iron recoveries varied from 96.8 to 105.6 percent. Compared with the official method, the proposed method for preparation of solutions results in a substantial saving of time and material.

Determination of added salt in finely ground feeds, L. REIMERS (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 397–399*).—A method depending upon gravity separation in carbon tetrachloride was found accurate for the finely ground feeds. The test can be made in less than 5 min. For pelleted feeds, because of the effects of solution and redeposit of some of the salt, the results were not sufficiently accurate, and such figures were multiplied by 1.33.

Glycerol in wines, M. A. AMERINE and W. C. DIETRICH. (Univ. Calif.) (*Jour. Assoc. Off. Agr., Chem., 26 (1943), No. 3, pp. 408–413*).—The periodic acid oxidation method for the determination of glycerol in wines was found to be

applicable to California wines. There was good elimination of sugars with lead acetate-barium hydroxide clarification. A method for the periodic acid oxidation of glycerol in the clarified solution is outlined.

Water solutions of superphosphate as a low-fluorine source of phosphorus, D. S. Reynolds, R. M. Pinckney, and W. L. Hill. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 4, pp. 564–575, illus. 2*).—With reference to the use of the water-soluble phosphate content of superphosphate as a supplement in animal feeding, the authors' results show that phosphate solutions carrying 9–12 gm. of phosphoric oxide per liter with 0.02–0.28 gm. of fluorine per liter can be readily prepared from ordinary superphosphate with the use of 7 gm. to 100 cc. of water, or a little more than 0.5 lb. per gallon. On dilution to a suitable concentration for the animals' drinking water, 0.4 gm. of phosphoric oxide per liter, for example, the fluorine concentration would be reduced to 1–11 p. p. m. Similarly, with the use of double superphosphate at the rate of 5 gm. per 100 cc. of water, or somewhat less than 0.5 lb. per gallon, the solution would contain 16–22 gm. of phosphoric oxide per liter with 0.06–0.33 gm. of fluorine per liter, which on dilution as before would yield a fluorine concentration of 1.5–6 p. p. m. The fluorine concentrations can be substantially reduced by the addition of a small quantity of ground limestone to the superphosphate-water mixture. Furthermore, the phosphoric oxide concentration can be roughly doubled by increasing the proportion of superphosphate in the initial mixture to approximately 1 lb. per gallon without significant alteration of the content of fluorine relative to that of the phosphate in solution.

False positive phosphatase tests, E. Kaplan (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 2, pp. 259–263*).—The usual control tests in phosphatase methods for the determination of pasteurization, designed to check deterioration of reagents and to note the presence of interfering substances in the sample, do not indicate the presence of thermostable substances of bacterial origin showing a phosphatase activity. In order to recognize false positive reactions, the usual reagent control and the control on an unincubated portion of the sample are first carried out in order to eliminate preformed phenolic substances and other interferences of this type. The sample is then repasteurized in the laboratory. A 5-cc. portion of the suspected material is transferred to a test tube and then maintained in a water bath for 30 min. at a temperature in the sample of ca. 145° F. The milk or cream is frequently stirred by means of an accurate thermometer, the bulb of which is kept constantly immersed in the sample. A phosphatase test as well as an unincubated control is then made on the repasteurized portion. If there is no significant lowering of the phosphatase reading as a result of the repasteurization procedure, the original test is judged false positive and is presumed not to be associated with faulty pasteurization technic. Wherever possible, total bacterial plate counts and direct microscopic counts are also made.

Tobaccos classified according to nature of their alkaloids, L. N. Markwood and W. F. Barthel. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 2, pp. 280–283*).—Powdered tobacco is treated with sulfuric acid (9 + 1), water is added, and the mixture is warmed, then cooled and filtered. The filtrate is made strongly alkaline and extracted with benzene; the benzene extract is then extracted with 0.1 N hydrochloric acid. The alkaloid picrate is formed and its melting point taken. According to the melting point, tobaccos are classified as follows: Nicotine type (melting point 215°–224° C.), mixed type (m. p. 190°–215°), and nornicotine type (m. p. 175°–200°).

Quantitative determination of nicotine and nornicotine in mixtures, L. N. Markwood. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 2, pp.*

283–289).—Nicotine and nornicotine occurring together are determined in aqueous solution by treatment of two portions of the solution. One treatment consists in adding to the solution sodium nitrite and acetic acid. The nitroso-nornicotine formed is not volatile in steam from a solution buffered at pH 10. The unchanged nicotine is steam-distilled off and determined by acidimetric titration or by precipitation with silicotungstic acid. The other treatment consists in methylating the nornicotine to nicotine by means of formaldehyde and formic acid. The total alkaloid, now nicotine, is distilled off after addition of excess sodium hydroxide and determined as before. The difference between the two values represents the nornicotine. Details of procedure for attaining an accuracy of 97–98 percent in the determined values for each component of the mixture were developed.

Determination of nicotine and nornicotine in tobaccos, C. V. Bowen and W. F. Barthel. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 12, pp. 740–741*).—The total steam-volatile alkaloids are isolated by steam distillation from a strongly alkaline solution containing sodium chloride in excess. One aliquant of the distillate is treated with silicotungstic acid to precipitate nicotine and nornicotine. Another is treated with nitrous acid, steam-distilled from an alkaline solution, and the nicotine precipitated as a silicotungstate. The nornicotine is determined by difference. Analysis of tobaccos differing widely in alkaloid content shows the rather common occurrence of nornicotine. This is essentially Markwood's method, above noted, with the addition of a steam distillation procedure which obviates the difficulty of extracting the alkaloids completely with ether or with hydrocarbon solvents from plant materials made alkaline to liberate the alkaloids.

Comparison with nicotine determinations by the conventional methods showed the unreliability of the heretofore-accepted method of analysis when nornicotine is present.

Methods of estimating the physical and chemical composition of cattle, T. H. Hopper. (N. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 6, pp. 239–268, illus. 7*).—The author reports the following findings, among others, with respect to determinations upon which the required estimates can be based: The physical composition of the whole and edible portion of the wholesale and 9–11 rib cuts is highly correlated with the physical composition of the empty body, carcass, and edible portion of the carcass, especially with reference to percentage of fat. The chemical composition of the whole and edible portion of the wholesale rib cut is highly correlated with that of the empty body, carcass, and edible portion of the carcass. There is a high correlation between the percentage of fat (separable adipose tissue) and ether extract (true chemical fat) in the several portions of the animal.

The dressing percentage is not a reliable indicator of fatness. The chemical composition on the ether extract-free basis is a function of age with small regression coefficient. For some purposes the mean might be considered a practical constant. However, for practical application, the small variation with age should be recognized in using the composition on the ether extract-free basis as a means of prediction of the percentages of moisture, ash, and crude protein in the empty body, carcass, and edible portion of the carcass. The percentage of ash in the edible portions may be predicted from the percentage of ether extract nearly as well as by laboratory analysis. The edible portion of the 9-11 rib cut was selected as an indicator of the physical composition of the edible portion of the carcass. The percentages of ether extract in the empty body and carcass may be indicated by the percentage of ether extract in the 9–11 rib cut and in the edible portion of the carcass from that in the edible portion of the 9–11 rib cut. The percentages of ether extract may also be estimated from the percentages of fat estimated or determined for the three

gross portions only. The percentages of moisture, ash, and crude protein in the gross portions may be estimated from the mean ether extract-free composition corrected for variations due to age.

The occurrence of squalene in natural fats, J. FITELSON (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 4, pp. 506–511, illus. 3*).—Concentration of the squalene is effected by a selective adsorption treatment of the unsaponifiable matter with aluminum oxide, the squalene appearing in the unadsorbed filtrate. After being treated with hydrochloric acid gas, the residue is washed with petroleum benzine in order to dissolve contaminating material, and the insoluble chloride is then recrystallized from acetone and examined microscopically. Fats containing as little as 2 mg. of squalene per 100 gm. of fat can be examined successfully by this method.

The squalene content of 23 fats was determined. The results range from none in cocoa butter to a maximum of 708 mg. per 100 gm. in one sample of olive oil.

Detection of olive oil in edible oil mixtures, J. FITELSON (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 4, pp. 499–506*).—The squalene is concentrated in a fraction obtained by the selective adsorption treatment of the unsaponifiable matter. The unadsorbed residues from olive oil consist almost entirely of squalene, and the unsaturated material in the much smaller residues from other oils consist largely of squalene. The unsaturation of these residues is assumed to be due to squalene, and the quantity of this hydrocarbon present in oils is calculated from the total halogen absorption. The results obtained by this method show good reproducibility.

Methods for determination of fat in dog food, E. D. SCHALL and M. H. THORNTON. (Ind. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 404–407*).—The fat content of ingredients used in canned dog food as determined by acid hydrolysis methods was always higher, regardless of the nature of the material analyzed, than that shown by ether extraction. On the basis of their glycerol content, the true fat present in the ether extract and the acid hydrolyzate extract of the dog food was found to be 98.8 and 68.5 percent respectively. Therefore, it appears that approximately 30 percent of the extract given by the acid hydrolysis method consists of materials other than fat. If the extracts are considered on the basis of the quantity of true fat present, the results are approximately the same regardless of the method used.

Modification of the yeast-growth assay method for biotin, R. HERTZ (*Soc. Expt. Biol. and Med. Proc., 52 (1943), No. 1, pp. 15–17, illus. 1*).—The yeast growth method of E. E. Snell, R. E. Eakin, and R. J. Williams[2] was modified by addition of a biotin-free casein hydrolyzate to the test medium in order to effect more nearly maximal growth of the organism (*Saccharomyces cerevisiae*) and eliminate the occurrence of nonspecific stimulation. This improvement in the medium resulted in an increase in both the specificity and range of biotin determinations. Addition of the following factors, singly or in combination, to the test medium did not affect the biotin values obtained: Pimelic acid, nicotinic acid, riboflavin, adenine, guanine and uracil, choline, and ethanolamine. In order to prevent alteration in day-to-day results, it was found necessary to keep the age and preparation of the inoculum quite constant. A characteristic turbidimetric biotin assay curve obtained by the modified method is presented. This shows that the test is most practicable within the range from 1×10^{-4} to 3×10^{-4} μg. Recovery tests ranged between 90 and 110 percent, and successive dilutions of an unknown material checked within 5 percent.

Niacin-niacinamide differentiation in the microbiological assay procedure, L. ATKIN, A. S. SCHULTZ, W. L. WILLIAMS, and C. N. FREY (*Jour. Amer. Chem.*

[2] Jour. Amer. Chem. Soc., 62 (1940), No. 1, pp. 175–178, illus. 1.

Soc., 65 (1943), No. 5, p. 992).—The reaction of bromine and potassium hydroxide on amides (Hofmann's reaction) when applied to niacinamide converted it to β-aminopyridine which failed to stimulate the test organism employed in the microbiological assay method of Snell and Wright (E. S. R., 87, p. 12). Results obtained in the assay of niacin, niacinamide, and a mixture of the two, given in each case preliminary treatment with these reagents followed by neutralization, indicate that this reaction offers possibilities in differentiating the forms of niacin occurring naturally.

A Neurospora assay for pyridoxine, J. L. Stokes, A. Larsen, C. R. Woodward, Jr., and J. W. Foster (*Jour. Biol. Chem., 150 (1943), No. 1, pp. 17–24, illus. 1*).—The present method utilizes an X-ray-induced mutant strain of the mold *N. sitophila* (produced by Beadle and Tatum), requiring added pyridoxine for growth except under very special conditions of pH and nitrogen nutrition. The organism is grown in stock cultures on Sabouraud agar slants, and the inoculum is prepared as a uniform suspension of a small portion of the agar growth in sterile water. For the test a drop of the spore suspension is added to each of the flasks containing the basal medium and graded amounts of the extract to be assayed. The basal medium contains sucrose, biotin, and various salts, including ammonium tartrate as a nutrient and KH_2PO_4, both of which serve to keep the pH below the critical level 5.8–6.0, and $ZnSO_4$ which represses sporulation and facilitates harvesting of the mold.

After incubation of the inoculated flasks for 5 days at 30° C., the mat, or pellicle, of fungus growth that develops on the surface of the medium if pyridoxine is present is removed, dried superficially, rolled into a pellet, and dried at 100° for 2 hr. Negative control and standard flasks, the latter containing increments of pyridoxine ranging from 0.1γ to 1.0γ, are similarly treated. The weight of mold growth on the test material is referred to the standard curve established for the pure pyridoxine. Since the method is based on the weight of mold growth, it can be readily applied to highly colored or turbid solutions. Finely ground or chopped samples are prepared for assay by autoclaving in 1 N HCl. Any thiamine present is destroyed by a modified sulfite cleavage method, since thiamine stimulates growth of the organism in the presence of suboptimal amounts of pyridoxine. The reliability of the method is indicated by agreement of assay values at different dosage levels, duplication of results in different experiments, quantitative recovery of added pyridoxine (within the limits of experimental error), and agreement of values for meats, wheat, and wheat products (reported) with results obtained by animal assay.

Determining riboflavin in dried milk products.—III, A comparison of the methods of assay, R. A. Sullivan, A. Beaty, E. Bloom, and E. Reeves (*Arch. Biochem., 2 (1943), No. 3, pp. 333–343*).—In continuation of this study (E. S. R., 85, p. 384), buttermilk from sweet cream was assayed for riboflavin content by several methods, including the photometric procedure previously developed for dried milk products (E. S. R., 83, p. 152), the Bourquin-Sherman rat growth technic (E. S. R., 66, p. 410) with certain modifications, a chick-assay procedure employing a ration previously described (E. S. R., 88, p. 378), and the microbiological procedure of Snell and Strong (E. S. R., 82, p. 587). Results by the various methods were often not in agreement, suggesting that buttermilk from sweet cream contains factors which produce erroneous results in riboflavin assays by biological methods. Good agreement was obtained between the photometric test and the microbiological assay if fat-soluble factors were removed before applying the latter procedure and the basal medium was supplemented with hydrolyzed casein, lactose, biotin, guanine, and a specially prepared liver extract.

A rapid colorimetric method for the quantitative determination of starch in textile fabrics, R. L. McEwen (*Amer. Dyestuff Rptr., 32 (1943), No. 17, pp.*

371–373, illus. 2).—The method described is based on the colorimetric method applied by Nielsen (E. S. R., 91, p. 9) to the determination of relatively large amounts of starch in vegetables and consists in solubilizing the starch with a cold 42-percent solution of perchloric acid and, after neutralizing the excess perchloric acid and acidifying with acetic acid, determining the extracted starch with iodine. The blue color developed is read in a photoelectric colorimeter, using a red filter to decrease the error due to dextrins.

AGRICULTURAL METEOROLOGY

Meteorology (*War Dept.* [*U. S.*], *Tech. Man. No. 3–240 (1942), pp. 51+, illus. 25*).—The three main sections of this manual deal, respectively, with weather elements, effect of weather on chemical agents, and weather forecasting.

Snow surveys and irrigation water forecasts for the Colorado River Drainage Basin, March 1, 1944. (Coop. Colo. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv., 1944, pp. 6+*).—In addition to a summary of the water-supply outlook, tabulated data are presented on the March 1 snow surveys and comparison of findings with those of previous years by watersheds; precipitation data; and a summary of Federal and State cooperative snow surveys on the Colorado River watershed.

Spot forecasting approach to synoptic forecasting, C. F. Brooks (*Amer. Met. Soc. Bul., 25 (1944), No. 1, p. 35*).

Mathematical relations for psychrometric data, C. C. Minter (*Amer. Met. Soc. Bul., 25 (1944), No. 2, pp. 57–59*).—"The constant in Maxwell's hygrometric equation can be evaluated by employing the experimental data of the humidity tables. Then when the vapor pressure of water as a function of temperature is substituted in the evaluated Maxwell equation, mathematical relations can be derived for the calculation of relative humidity, dew point, and the humidity at freezing temperatures."

Note on the relation between winter and summer temperatures at Oswego, New York, E. F. Loveridge (*Amer. Met. Soc. Bul., 25 (1944), No. 2, pp. 59–60*).

Precipitation regions in the United States, S. S. Visher (*Sci. Mo., 58 (1944), No. 5, pp. 386–392, illus. 8*).—Great differences within the United States in precipitation, both average and seasonal, have encouraged the recognition of precipitation regions; areas with an annual average above 30 in. are called humid, those normally receiving less than about 10 in. are called arid, areas with averages of 10–20 in. are frequently classed as semiarid, and those receiving 20–30 in. are sometimes called subhumid. A fifth region, summer dry, is recognized for the Pacific coast. Maps of the United States are presented to illustrate the above five precipitation regions, normal annual precipitation-effectiveness, regions of different seasonal precipitation, percentage of warm-season rain falling at night, adequacy of rainfall, percentage deviation from the mean annual precipitation, frequency of very hard rains, and the 12 precipitation regions into which the country may be divided. These are discussed in some detail.

Growth and seed yields of native prairie plants in various habitats of the mixed-prairie, H. R. Brown (*Kans. Acad. Sci. Trans., 46 (1943), pp. 87–99*).—During the 3 yr. under study climatic conditions were extremely variable, precipitation in 1939 being 7.84 in. below normal, in 1940 about normal, and 4.44 in. above normal in 1941. The mean annual temperature for 1939 was 3.1° F above normal, in 1940 about normal, and in 1941 only 1.2° above normal. The soil content of water correlated closely with precipitation. During the 1939 summer and fall no soil moisture was available for plant growth in the upper 3 ft. of soil and in 1940, only in the upper 2 ft. (except in July–August, when it

was more available in the upper 6 in.). In 1941 it was available in the upper 3 ft. every month except July, when it was not available in the upper 12 in. of soil. All types of vegetation suffered greatly in the fall drought of 1939, the more xeric species suffering least; in the wet season of 1941 most species more than regained their losses of the preceding 2 yr. Detailed data are presented for different species, from which it is concluded that growth and seed yields correlated very closely with the amount of available soil moisture during each season of growth.

El clima de "Presidencia Roque Saenz Peña" y su relación con el cultivo del algodonero [The climate of the "Presidencia Roque Saenz Peña" [Chaco] in relation to the cultivation of cotton], J. R. Báez (*Univ. Nac. La Plata, Rev. Facult. Agron., 3. ser., 25 (1940) (pub. 1943), pp. 225–226*).—Brief summary of a thesis, National University of La Plata.

SOILS—FERTILIZERS

Physical land conditions in Schuyler County, New York, J. A. Bonsteel and B. J. Patton (*U. S. Dept. Agr., Soil Conserv. Serv., Phys. Land Survey No. 31 (1943), pp. 65+, illus. 30; separate maps 43*).—Results of a detailed soil and erosion survey.

The influence of cropping on the nitrogen, phosphorus, and organic matter of the soil under irrigation farming, J. E. Greaves and C. T. Hirst (*Utah Sta. Bul. 310 (1943), pp. 19*).—The level of nitrogen, phosphorus, and organic matter in the surface 3 ft. of soil was determined in 1916 and 1934 to ascertain the effect of the following cropping systems under irrigation agriculture on the above soil constituents: Continuous alfalfa; continuous fallow; alternate oats and fallow; continuous oats; continuous beets 11 yr., 30 tons manure annually with beets, alfalfa 8 yr.; beets 11 yr., 10 tons manure annually with beets, alfalfa 8 yr.; beets 11 yr., no manure, alfalfa 8 yr.; and alfalfa, alternate corn and beets, alfalfa. Continuous alfalfa removed 1,902 lb. of nitrogen from the sedimentary soil under study.

The continuously fallowed plat lost 4,542 lb. of total nitrogen during the 19 yr., all of which was caused by erosion and leaching. Where alternate oats and fallow were practiced the loss was even greater, 5,076 lb. from the first 3 ft. of soil. This was practically the same when oats were grown continuously on the soil. The soil on which sugar beets were grown and to which 30 tons of manure were applied annually lost 1,404 lb. of nitrogen. This, together with the added nitrogen, makes a total loss of 6,710 lb. in the 19 yr. When sugar beets and alfalfa were planted the loss was not so great as when oats were grown continuously on the soil. The gross loss of nitrogen from the soil when sugar beets and alfalfa were grown was less where 10 tons of manure was added than where 30 tons per acre were added. Hence 10-ton applications of manure to this soil under these cropping systems appears to be more economical than 30 tons per acre. From 11 to 100 percent of the nitrogen disappearing from the soil was recovered in the crop.

Taking the time required for each cropping system to remove the equivalent of the phosphorus in the surface foot of soil as a basis for comparison, the following results are obtained: Where beets were grown continuously with the addition of 30 tons of barnyard manure per acre, the phosphorus would be sufficient for an indefinite cropping; where beets were grown continuously with the addition of 10 tons of barnyard manure per acre annually the phosphorus in the soil would be sufficient for 382 yr.; where alternate oats and fallow was the procedure the phosphorus would be sufficient for 274 yr.; where oats were grown

continuously the phosphorus would be sufficient for 192 yr.; where beets were grown continuously the phosphorus would be sufficient for 158 yr.; where alternate corn and beets were grown the phosphorus would be sufficient for 143 yr.; and where alfalfa was grown continuously the phosphorus would be sufficient for 108 yr. During the life of this experiment the soil anuually lost the following percentages of organic matter from the surface foot: Continuous fallow 3.9, alternate oats and fallow 1.6, continuous oats 2.6, beets and no manure 0.9, and alternate corn and beets 1.3. The soil that was planted in alfalfa gained 1.9 percent, that in beets and receiving annually 30 tons per acre of manure gained annually 1.2 percent of organic matter, and that in beets with 10 tons of manure per acre gained 0.3 percent of organic matter. That is, the soils which decreased in organic matter lost annually from 0.5 to 1.7 tons per acre. The soil which produced continuous alfalfa and that which had received 30 tons of manure per acre annually gained 0.7 ton of organic matter per acre annually.

Some edaphic and ecological effects of water spreading on range lands, D. S. Hubbell and J. L. Gardner. (U. S. D. A.). (*Ecology, 25 (1944), No. 1, pp. 27–44, illus. 5*).—From an 8-yr. study of the vegetation and soils in portions of three valleys in northwestern New Mexico as affected by water and sediment diverted from ephemeral streams, it was found that except for changes in soil texture flooding had but little effect on the soils of the areas. Soil texture in the first 1,500 ft. from the spillway became more sandy; at more distant points either the clay fraction increased or the texture remained unchanged. The amount of organic matter in the sandier deposits was less than in the original soil, whereas the opposite was true of the heavier-textured deposits. Changes in soil nutrients were slight except for nitrates, which decreased; P showed little if any change. Aerobic bacteria decreased in number with a lightening of the soil texture and increased in soils which became heavier. Soil moisture in the second and third foot was higher in the flooded than in the unflooded areas. Under flooding, the vegetation showed a net decrease in density owing to heavy deposits of sediments; but there was a net increase in forage production as compared to unflooded areas. *Hilaria jamesii* showed a loss of density under sedimentation, but increased where sediment was not a major factor. *Agropyron smithii* invaded many of the heavily silted areas. *Muhlenbergia repens* withstood silting moderately well, whereas *Aristida longiseta* and *Bouteloua gracilis* proved very sensitive to such deposits.

Investigations in erosion control and reclamation of eroded land at the Blackland Conservation Experiment Station, Temple, Tex., 1931–41, H. O. Hill, W. J. Peevy, A. G. McCall, and F. G. Bell. (Coop. Tex. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 859 (1944), pp. 109+, illus. 37*).—This publication presents the results of 10 yr. of work in the determination of the cause of soil erosion and the development of soil and water conservation practices at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex.

During the 11 yr. of record, the control plat planted continuously to cotton lost 226 tons of soil per acre. Three rainstorms caused 27 percent of this loss and 14 storms accounted for 52 percent of the total soil loss. The amount of soil loss is influenced by the intensity of the storm, the antecedent rains, the presence of or absence of plant cover, and the physical condition of the surface soil. Rainfall on a wet, tightly compacted soil caused almost five times greater loss than one of similar amount and intensity falling on a moist, loosely packed surface. A moderate rainfall of high intensity falling on dry loose soil that had been subjected to flat cultivation produced much higher runoff and soil loss than a similar rain falling on similar soil that had been left in a cloddy moist condition. These records, together with other experimental data, furnish ample evidence of the fact that modifications of cultural practices can be made to play an important

part in the management of the soils of the Texas Blackland area. Established plant cover, such as Bermuda grass, was the most effective means of reducing runoff and controlling erosion. Of the cultivated plants, oats have given effective protection, due largely to the fact that this crop is at its maximum growth period during the spring months when protection is most needed. Contrary to the findings at the other stations, the control plats on the Blackland soils have indicated a slight increase in runoff and soil loss for the shorter slopes. The terraced fields, however, have shown a fairly consistent increase in soil loss with increase in the length of the slope between the terrace ridges.

Runoff from the desurfaced plat has been about 2.5 times that from the surface soil and soil loss about 1.5 times greater. Contour farming without strip cropping or terraces increased the danger of concentrating runoff water and the formation of severe washes that eventually developed into gullies. Cost of farming on the contour or parallel with the terraces was slightly greater than with the rows across the terraces parallel with the field boundaries, but the latter practice materially lowered the terrace height and resulted in overtopping on numerous occasions. The better control exhibited by the rotated crops, as compared with continuous corn, was due probably to the inclusion of oats in the rotation. No residual effect of the oats on the succeeding crop was apparent, indicating that the favorable effect of the rotation was due only to the cover afforded by the oats when it actually occupied the ground. Field plat data show that crop rotations containing small grains are effective in reducing soil and water losses and that this saving is greatly enhanced by strip cropping when the proper sequence is followed. Further data indicate that the combination of strip cropping with terraces is slightly more effective than either of these soil-conserving measures used alone.

Terraces with vertical intervals of from 2.5 to 3.5 ft. gave satisfactory performance where the maximum land slope was limited to a little over 5 percent. Data from terraces of various lengths indicate there is no optimum length from the standpoint of soil and water losses. The distance to a desirable and efficient terrace-outlet channel will determine the length of the terrace. Soil losses from the variable grade terraces were slightly less than from those of uniform grade.

The problems of soil conservation involve the rebuilding of severely eroded areas as well as the reduction of soil losses. Results from this station have shown that, in general, Blackland soils respond satisfactorily to additions of organic matter. Hubam clover and selected strains of cowpeas offer possibilities for soil-building purposes, 1 year's results on eroded Austin clay showing an increase in the yield of cotton following Hubam clover as compared with cotton after corn. The yield of corn after Hubam clover was about the same as corn after cotton. Experience has shown that land too severely eroded to remain in cultivation can best be utilized in this area by revegetation to grasses. One hundred and twenty species of grasses are under observation at this station to determine the possibilities for their use in soil conservation.

Publications and visual information on soil conservation, E. G. Rogers (*U. S. Dept. Agr., Misc. Pub. 446, rev. (1944), pp. 20*).—In addition to the regular publications and visual material, this revised list (E. S. R., 86, p. 266) presents special wartime publications of the Soil Conservation Service.

Adjusting crop acreages for war production to the soil resources of Iowa, A. J. Englehorn and A. C. Bunce. (Partly coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 324 (1943), pp. 105–140, illus. 1*).—The introductory remarks point to the wartime as well as peacetime need for soil conservation and indicate that maximum production can be attained only when the acreage of intertilled crops is related to the soil type, slope of the land, and the erosion control practices. The objective of the study was to determine the maximum acreage of intertilled

crops for war production and to indicate the areas where they should be grown so as to avoid permanently impairing soil resources. The bulletin presents in tabular form a detailed account of lands in each use class in each county, with county planning board recommendations, war estimates, and approximate post-war adjustments. Basic data are presented on the groups of major soil types in the State, the acreage of each slope class in rotation or cropland, suggested rotations for the various soil types and slope classes, and the percentage of the land which will be in various crops if these rotations are followed.

Organic matter in Iowa soils, A. G. Norman (*Iowa Sta. Bul. P57 (1943), pp. 825–848, illus. 7*).—This bulletin covers a popular presentation of the importance, nature, source, amount, and functions of soil organic matter and management systems for the maintenance of soil organic matter.

Chemical composition and responses to fertilization of western Oregon nut orchard soils as indicated by greenhouse and field trials, R. E. Stephenson and C. E. Schuster. (Coop. U. S. D. A.). (*Oregon Sta. Tech. Bul. 3 (1943), pp. 31*).—Soils were sampled by horizons for studies of nutrient availability by means of chemical and greenhouse tests. Cover crop effects were determined through field trials. Soils investigated were supporting walnut or filbert orchards or were selected to provide data for comparison with other orchards and included the Aiken, Olympic, Sites, Carlton, Melbourne, Willamette, Salkum, Amity, Chehalis, and Newberg series.

Chemical tests for measuring available plant nutrients in the soil that may serve as a basis for a fertilizer recommendation were found to have only a limited value in the case of fertilization of cover crops in western Oregon nut orchards. Greenhouse trials are more valuable than chemical tests. These trials require from 6 to 10 weeks and give rather definite information as to soil deficiencies for any particular plant. The sunflower has proved to be a good indicator plant for greenhouse studies. In field trials, orchard cover crops are affected by deficiencies of those elements found to be most deficient by greenhouse methods using the sunflower as an indicator. Small field plats have been very helpful in quickly obtaining data that may tentatively serve as a basis for a fertilizer recommendation.

No type of study that fails to give adequate consideration to the physical properties of the soil can be considered a proper basis for orchard soil management practices. The tentative conclusion to date is that orchard soils should be subjected first to physical studies throughout a 10-ft. profile, particularly with reference to the depth, capillary porosity, and noncapillary porosity, which may control aeration and moisture relations. Physical studies, supplemented perhaps by chemical studies, should be accompanied by greenhouse trials to establish major and minor soil deficiencies. These should be followed by long-time trials in the field where the cumulative effect of the use of various fertilizers over a period of years may be established.

The authors conclude that a fertilizer program for nut orchard soils must provide nitrogen, phosphorus, and probably sulfur. These fertilizers should be used with a humus-renewal program in which the cover crop may receive a major portion of the fertilizer. The rate of fertilizer applications must be liberal to get satisfactory responses.

Commercial fertilizers for Oklahoma crops, H. J. Harper (*Oklahoma Sta. Bul. 279 (1944), pp. 47, illus. 15*).—Placing special emphasis on the importance of obtaining maximum production of agricultural produce during the current wartime demand, this bulletin gives many ways where the proper amount and kind of commercial fertilizers give greatly increased yields of feed and food crops. Recommendations are set forth on kind and amounts of commercial fertilizers for most of the field, orchard, and vegetable crops commonly grown

in Oklahoma. The field crop recommendations are based on results obtained from 434 fertility experiments conducted in 62 Oklahoma counties during the past 21 yr. A description of the different types of fertilizer materials and grades and a discussion of conditions affecting the response of crops to fertilization are included.

Buying fertilizer for cotton in 1944, W. B. Andrews (*Mississippi Sta. Cir. 116 (1944), pp. 11, illus. 2*).—This publication stresses the importance of using the proper fertilizer for maximum wartime production of cotton on the various soils of the State. Cotton, because of the many uses to which the crop is put, is a vital war crop, and obtaining maximum production is thus a wartime job of first importance for cotton producers. The experimental results presented show the most profitable analysis of fertilizer for cotton for the following soil areas of the State: Shortleaf pine, northern longleaf pine, Pontotoc Ridge, northeast highland, and northeast and central prairies.

How and where to use lime in western Washington, S. C. Vandecaveye and L. E. Dunn (*Washington Sta. V Cir., 16 (1944), pp. 3*).—A popular circular discussing the need and sources of lime and the time to apply lime.

The boron needs of New Jersey soils, E. Reeve, A. L. Prince, and F. E. Bear (*New Jersey Stas. Bul. 709 (1944), pp. 26, illus. 4*).—A comprehensive treatment in both the field and laboratory of methods for determining need for boron by soils and various crops, amount of boron present in different soils, and physiological and chemical factors involved in the use of boron.

Turnips showed typical symptoms of boron deficiency on 42 of 156 farms on which they were sown for test purposes. Definite crop response was obtained from the use of borax on 12 percent of 350 widely distributed farms. Based on both laboratory and greenhouse tests, a water-soluble boron content of 0.35 p. p. m. of air-dry soil was set as the dividing line between boron-deficient and boron-adequate soils. Of 200 soil samples chosen from an equal number of New Jersey farms and submitted to laboratory test, 88 were found to be in the boron-deficient group. Of representative samples of 20 important soil types under special study at the experiment station, 8 were found to be deficient in boron. Crops growing on well-limed soils were found to be more responsive to borax treatments than those on very acid soils. Raising the pH of acid soils had little effect on their content of water-soluble boron. Loam and silt loam soils were shown to fix a great deal more boron than the sands and sandy loams, and crops growing on the heavier soils were less easily injured by heavy applications of borax. From 75 to 85 percent of a 20-lb.-per-acre application of borax was washed out of 7-in. depths of 4 soil types by leaching them with an amount of water equivalent to one-fourth the average annual rainfall of the State.

The amount of water-soluble boron in soils was materially increased by the addition of green manures. Such organic materials as straw, manure, and cottonseed meal contained very little boron, however, and a good many tons of them would have to be added to the soil to supply as much of this element as does 10 lb. of borax. Marked increases in the yield of carrots, spinach, clover seed, and alfalfa were obtained by the use of from 10- to 40-lb.-per-acre applications of borax to the soil. Alfalfa hay contained boron equivalent to nearly 2 lb. of borax per ton when grown on soils that were adequately supplied with the element. A typical case of boron deficiency on Dutchess, Rome, and McIntosh apples was found in an orchard in Passaic County. The Sassafras soils of southern New Jersey were shown to be conspicuously deficient in boron, whereas the Collington soils were very well supplied with the element. Crops growing on Lakewood, Penn, Gloucester, Merrimac, and Wethersfield soils were frequently benefited by borax treatments, but those on the Dutchess, Washington, Dover, and Chester series were not. Of the important crop plants, alfalfa, clover, spinach, celery,

cabbage, cauliflower, tomatoes, turnips, rutabagas, beets, carrots, and radishes are most likely to need extra boron. Typical symptoms of boron deficiency have been observed on all of these crops at various locations over the State. Snap beans, limas, soybeans, and sweetpotatoes are extremely sensitive to an overdose of borax, especially when growing on the sandier soils. Of the 55 grades of fertilizer offered for sale by 14 companies operating in New Jersey in 1942, 51 contained boron. The highest content of boron found in any brand was equivalent to 5.52 lb. of borax per ton. It is suggested that to all fertilizers sold in the State about 5 lb. of borax per ton be added as a means of maintaining a fair supply of boron in the soil. In areas of marked deficiency, however, and for such high-boron-requirement crops as alfalfa, clover, beets, turnips, celery, and cauliflower, heavier applications may be required. The authors point out that great care must be exercised not to exceed the recommended rates of application of borax.

Commercial fertilizers, 1943, E. R. TOBEY (*Maine Sta. Off. Insp. 189 (1943), pp. 33–59*).—Analytical data resulting from the 1943 inspection of commercial fertilizers are here recorded.

AGRICULTURAL BOTANY

Recopilación tecnológica de botánica y de patología vegetal [Technological summary of botany and plant pathology], J. C. BERTELLI (*Rev. Asoc. Ingen. Agrón. [Montevideo], 15 (1943), No. 4, pp. 34–69*).—This is a compilation of terms and concepts used in botany and plant pathology according to the bibliography cited (15 references), with some suggestions by the author.

"Sulphur microbe" casts light on life processes (*Wisconsin Sta. Bul. 461 (1943), pp. 50–51, illus. 1*).—Study of a hardy sulfur-eating bacterium (*Thiobacillus thiooxidans*) has brought out evidence on the fundamental nature of certain life processes and has provided both clues and technics for future investigations of photosynthesis, according to results briefly summarized.

Inoculation of media for mold culture, V. H. WALLINGFORD, A. H. HOMEYER, and H. B. GRONEMEYER (*Science, 99 (1944), No. 2570, p. 266*).—In cultivating molds in large containers it is sometimes difficult to obtain uniform inoculation and even growth over the surface of the medium. A technic successfully used for *Penicillium* and here described in detail employs a suspension of spores in a medium containing gum tragacanth in which a small amount of lanolin has been emulsified. The lanolin particles appear to assist in buoying up the spores to the surface and holding them there until germinated.

Relation of dual phenomenon in Penicillium notatum to penicillin production, H. N. HANSEN and W. C. SNYDER. (Univ. Calif.). (*Science, 99 (1944), No. 2570, pp. 264–265*).—Single spore analysis of a stock culture of *P. notatum* indicated it to be another case of the dual phenomenon discovered by the first author in 1938 (E. S. R., 80, p. 22). The two components in *P. notatum* are said to be a normal conidial or *C* type and an abnormal mycelial or *M* type. The latter arises repeatedly as a mutation in physiologically aging colonies of the *C* type, even though the culture be started from a single conidium, and where mass transfers of inoculum are employed the *M* type is apt to become predominant. This *M* type is presumed to be the form which various workers have reported as a poor producer of penicillin. To maintain maximum production of penicillin the highest yielding clone must be used and kept monotypically pure and free of recurring mutants. The same procedure must be followed with the assay strain, according to the results here presented.

An antibiotic substance from species of Gymnoascus and Penicillium, E. O. KARROW and J. W. FOSTER (*Science, 99 (1944), No. 2570, pp. 265–266*),—

Through the studies of various workers the antibiotic substances from *Aspergillus clavatus*, *P. patulum*, and *P. claviforme*, and variously called clavacin, patulin, and claviformin, have been shown to be identical. The present authors have isolated, from an undefined species of *Gymnoascus* and from *Penicillium* sp. freshly isolated from soil, a substance shown to be identical to those noted above.

Present-day classification of algae, F. E. Fritsch (*Bot. Rev., 10 (1944), No. 4, pp. 233–277*).—In this comprehensive review (168 references) only the broader aspects of algal classification are, in general, taken into consideration. These comprise the interrelations of flagellates and algae, classification of flagellate and coccoid forms and of the remaining Chlorophyceae, and classification of the Phaeophyceae, Rhodophyceae, Myxophyceae, and diatoms; and a tabulation and discussion of the interrelationships of the various algal classes.

Flora of Panama, II, Fascicles 1–3, R. E. Woodson, Jr., R. W. Schery, et al. (*Ann. Missouri Bot. Gard., 30 (1943), Nos. 2, pp. 97–280+, illus. 31; 3, pp. 281–403+, illus. 46; 31 (1944), No. 1, pp. 172+, illus. 99*).—This Flora of Panama is a compilation of the indigenous and naturalized vascular plants of the Republic of Panama, following generally the system of Engler and Prantl. Since the completed work will be extensive, it will consist of a number of parts designated numerically, each with separate pagination and pertinent illustrations. The first portion of the work being published begins the taxonomic treatment of the Gymnospermae and Monocotyledonae, and is designated as part II. Fascicle 1 considers the Cycadaceae, Taxaceae, Typhaceae, Alismaceae, Butomaceae, Triuridaceae, and Gramineae—the last by J. R. Swallen (pp. 104–280). Fascicle 2 includes the Cyperaceae, by H. K. Svenson (pp. 281–325); Palmaceae, by L. H. Bailey (pp. 327–396); and Cyclanthaceae. Fascicle 3 contains the Araceae, by P. C. Standley (pp. 1–60); Lemnaceae; Mayacaceae; Xyridaceae; Eriocaulaceae, by H. N. Moldenke (pp. 65–71); Rapateaceae; Bromeliaceae, by L. B. Smith (pp. 73–137); Commelinaceae; and Pontederiaceae. The treatments of the various families are of a critical nature, including synonymy, descriptions, and citation of representative Panamanian exsiccatae for each species. Numerous keys for identification are provided.

Las leguminosas Argentinas—silvestres y cultivadas [Argentine legumes—wild and cultivated], A. Burkart (*Buenos Aires: Acme Agency, 1943, pp. 590+, illus. 135*).—The general part of this manual takes up the Leguminosae in relation to the morphology and anatomy of its members, their physiology and ecology, phylogeny and fossil forms, cytology, domestication and improvement, phytogeography and statistical considerations, and their varied uses. The second and main part of the work presents diagnoses and keys to the tribes and genera of the family and descriptions of the genera and individual species.

The botany of Citrus and its wild relatives of the orange subfamily (family Rutaceae, subfamily Aurantioideae), W. T. Swingle (In *The Citrus Industry.—I, History, Botany, and Breeding*, edited by H. J. Webber and L. D. Batchelor. *Berkeley: Univ. Calif. Press, 1943, pp. 129–474, illus. 50*).—This chapter represents a monograph involving comprehensive treatment of all known near relatives of *Citrus*. The work is not merely a botanical monograph, but a summary of what is known relative to the valuable, or possibly valuable, economic characters of each species included. During 1912–26, the author published 17 taxonomic papers on the orange subfamily and, while preparing this chapter, 6 additional contributions on the group during 1938–42 (e. g., E. S. R., 87, p. 35; 83, p. 40). Each tribe and every genus is keyed out fully so that any of them can be easily identified; 14 of the 33 genera contain only 1 species each so that here the key also identifies the species. The remaining 19 genera are supplied with keys to determine all the species. It is noted that no previous account of the orange subfamily describing all known genera and species has been published

for more than a century; that one contained only a third as many genera and less than a fourth as many species as the present work.

A possible function of vitamin K in plants, F. L. Wynd. (Univ. Ill.). (*Amer. Nat., 78 (1944), No. 774, pp. 59–67*).—Formation of precipitation membranes by plant protoplasm is said to resemble the clotting of blood in the following respects: In blood, cephalin frees prothrombin from the prothrombin-heparin complex; cephalin also occurs in plant protoplasm where it may have a similar function. Free Ca ions are necessary for the formation of a cytothrombin (=thrombin, ovothrombin) from a protoplasmic protein (=prothrombin). Chemical and physical agents further this process by freeing Ca ions from colloidal surfaces within protoplasm. Cytothrombin reacts with a cellular protein (=fibrinogen, pigment granules) to give a precipitation membrane (=fibrin, cytoplasmic membrane, vacuole membrane). The necessity of free Ca ions is eliminated by the presence of extracts of cell masses containing cytothrombin (=fresh blood clots, crushed invertebrate eggs, crushed plant cells). Extracts of crushed plant cells hasten the clotting of blood. The necessity of vitamin K in the formation of prothrombin in blood suggests that it may be concerned with the formation of a "cyto-prothrombin" in plant protoplasm. This substance could be a precursor of the precipitation membranes which prevent dissolution of plant protoplasm in water and also permit vacuole formation. There are 31 references.

The effect of auxin on protoplasmic streaming in root hairs of Avena, B. M. Sweeney (*Amer. Jour. Bot., 31 (1944), No. 2, pp. 78–80, illus. 3*).—Auxin accelerated protoplasmic streaming in root hairs of whole oats plants and of those from which the seeds and coleoptiles had been removed for 24 hr., the optimum concentration of indole-3-acetic acid being 10^{-4}–10^{-5} mg. per liter. This acceleration qualitatively resembled that obtained when auxin is added to sections of the coleoptile, but the optimum auxin concentration was considerably lower. Much larger accelerations of streaming were obtained in morning than in afternoon tests. The only effect of removing the seed and coleoptile was to prevent the inhibition of streaming which is caused in intact plants by concentrations of 1–10 mg. per liter; this was apparently not due to lower auxin or sugar contents in these plants. The rate of streaming in plasmolyzed root hairs remained unchanged for at least an hour after plasmolysis in 0.4 M fructose.

Plant growth under controlled conditions.—II, Thermoperiodicity in growth and fruiting of the tomato, F. W. Went. (U. S. D. A. et al.). (*Amer. Jour. Bot., 31 (1944), No. 3, pp. 135–150, illus. 9*).—Through use of the new air-conditioned greenhouses (E. S. R., 89, p. 190), the rate of stem elongation and the setting of fruit in tomatoes grown in gravel and watered with nutrient solution was found very uniform from plant to plant, week to week, season to season, and from year to year, provided they were subjected to the same temperatures. The rate of stem elongation is a sensitive indicator of the effects of different temperatures on the plants, and changes immediately on change of temperature. The growth rate was not found to depend on air humidity. When tomato plants were grown under constant temperature 24 hr. per day, the optimum lay well above 20° C. At 26.5° a steady growth rate of 23 mm. per day was reached when the plants were 30 in. tall, which rate was maintained as long as they were kept trimmed to one stem; at lower temperatures growth rates were consistently lower. However, plants kept at 26.5° during the day and at 17°–20° during the night grew more rapidly (27 mm. per day) than any of the other groups. The lower temperature was effective only when maintained during the dark period. About the same temperature relation held for fruit development. Fruit was set abundantly only when the night temperatures were 15°–20°; with lower and higher

temperatures at night, fruiting was reduced in amount or even absent. Artificial light applied during the cool period stopped fruit production. It is concluded that thermoperiodicity in tomatoes at day and night is due to the predominance of two different processes, of which the dark process has a much lower temperature optimum than the light process. From other work discussed, it is suggested that thermoperiodicity is a general phenomenon in the higher plants. There are 37 references.

Effects of oxygen tension on certain physiological responses of rice, barley, and tomato, J. Vlamis and A. R. Davis. (Univ. Calif.). (*Plant Physiol., 19 (1944). No. 1, pp. 33–51, illus. 9*).—Accumulation of bromide over a 24-hr. absorption period by excised roots of rice at different O_2 pressures proved similar to that for barley and tomato. Inflection in the accumulation curve of these plants was reached at about 3 percent O_2; at higher partial O_2 pressures only small increases in bromide accumulation occurred. The net accumulation of K was of similar character. Below 1 percent O_2, however, there was a rapid and appreciable loss from the initial K content of tomato and barley, and rice released K to a certain extent. Under anaerobic conditions preventing bromide accumulation by excised roots, rice roots with attached shoots accumulated appreciable amounts of bromide; roots of entire barley plants showed a smaller relative uptake; and intact tomato roots failed to accumulate, responding like excised roots. A pure CO_2 atmosphere prevented accumulation by excised roots of all the plants, and for entire plants it caused a similar inhibition accompanied by wilting of the shoot systems. Plants grown aerobically through the seedling stage and transferred to soil culture showed diverse responses to drainage and submergence over a 6-week period. On both loam and clay soils, submergence was lethal to tomato, retarded growth of barley, and improved that of rice. Aerobically grown seedlings transferred to water culture with continuous root exposure to air, CO_2, N, and methane for 6 weeks followed the general relations indicated by soil cultures. Compared to an unaerated control plant, aeration of the root system improved the growth of tomato appreciably and of barley to a small degree; rice growth was unaffected by aeration but the root tips became discolored. Passage of CO_2 through the root medium resulted in immediate wilting of all plants and no growth occurred. Tomato shoot and root growth was reduced by about 90 percent in N gas; barley, by 45 percent. Rice was comparable to the control. Methane stopped growth of the tomato plant and reduced that of barley to a greater extent than did N. Root growth of rice in methane was superior to that under all other treatments and 70 percent larger than the control. Nitrate as a source of nutrient N and potentially of O_2 failed to increase growth or K uptake in rice or barley as compared to NH_4 or NH_4NO_3 under anaerobic conditions of methane exposure to the roots. There are 22 references.

Effect of cyanide on rate of exudation in excised onion roots, H. F. Rosene (*Amer. Jour. Bot., 31 (1944), No. 3, pp. 172–174, illus. 6*).—When cyanide-free solutions surrounding onion roots in water culture were replaced by concentrations of 0.01, 0.005, 0.0025, or 0.001 molar KCN, the exudation rate fell gradually to an inhibition level, which was higher with the lower concentrations. The percentage inhibition was greatest when the initial cyanide-free exudation rate was higher. Evidence from experiments on exudation and on O_2 consumption is said to favor the theory that glandlike tissues in the roots are actively engaged in water transfer.

The exudation of glutamine from lawn grass, L. C. Curtis. (Conn. [New Haven] Expt. Sta.). (*Plant Physiol., 19 (1944), No. 1, pp. 1–5, illus. 2*).—The next day after application to lawn of a fertilizer high in $(NH_4)_2SO_4$ and KCl followed immediately by hose irrigation, during a period of no rainfall, cool nights,

and profuse guttation, the fertilized area took on a whitish cast which became increasingly conspicuous over 3 days. A small white deposit was found attached to the tip and side of each grass blade, and four other species in the lawn had similar deposits; chemical identification indicated the greater part of the white deposit to consist of glutamine. Attempts to reproduce the phenomenon experimentally failed; apparently the delicate balance between environal and internal plant conditions are not commonly encountered. It is significant that materials absorbed or elaborated by plants are at times eliminated in the guttation process. The fact that chemical compounds reach the outside of the leaf and remain there for varying periods is believed of some importance to those working with living plants; the various implications of the process are discussed.

Translocation of radiophosphorus in the phloem of the cotton plant, O. Biddulph and J. Markle. (Wash. State Col.). (*Amer. Jour. Bot., 31 (1944), No. 2, pp. 65–70, illus. 3*).—Radiophosphorus was found to move via the phloem in traveling from the leaf to other parts of the plant, the rate downward being in excess of 21 cm. per hour. As it entered the phloem of the stem from the injected leaf a concentration gradient was established extending both upward and downward from the point of entry. This suggests a pattern of movements analogous to those of simple diffusion, but the rate was much too great to be thus accounted for. Upward movement in the phloem varied from practically none to over 40 percent of the mobile phosphate, suggesting that some unknown internal factors may control both rate and direction of movement. In moving from the leaf via the phloem, P may diffuse quite readily into the xylem and reascend the stem with the transpiration stream, thus maintaining a "circulation" within the plant.

Versuchsergebnisse über die stimulierende Wirkung von Thoriumverbindungen auf das Pflanzenwachstum [Experimental results on the action of thorium compounds on plant growth], C. v. Gillern (*Jour. Landw., 89 (1943), No. 3, pp. 233–239, illus. 4*).—In tests with lupines grown in clay flower pots containing 10 kg. of soil each, thorium compounds exerted a stimulative action. Moreover, it was shown that the stimulative effect of the radioactive rays of these compounds brought about a more intensive utilization by the plants of the nutrients contained in the soil. The stimulative effect on yields was most pronounced following addition of 50 mg. of thorium hydroxide to each pot. It remains to be demonstrated whether equally favorable results can be obtained in field tests.

The influence of some respiratory inhibitors and intermediates on respiration and salt accumulation of excised barley roots, L. Machlis. (Univ. Calif.). (*Amer. Jour. Bot., 31 (1944), No. 3, pp. 183–192, illus. 8*).—A method for growing and preparing barley roots for use in microrespirometers is described, and the anatomical and metabolic characteristics of the root segments pertinent to their use in metabolic investigations involving measurements of gas exchange are discussed; on the basis of these data and with the method described, the author studied the nature of the respiratory system which is causally related to salt absorption in excised barley roots. Cyanide and azide inhibited about two-thirds of the respiration and at the same time prevented bromide accumulation; cytochrome oxidase is suggested as the enzyme affected. Partial inhibition by cyanide caused a disproportionately large inhibition of accumulation, apparently indicating a second unknown action of cyanide more directly related to salt accumulation than cytochrome oxidase inhibition. Iodoacetate and malonate inhibited both processes; and malate, succinate, fumarate, and citrate reversed the iodoacetate inhibition of both respiration and accumulation of salt and neutralized the malonate inhibition of accumulation. Reversal of malonate inhibition of the gas exchange was not observed with all the acids

and was slight in any case. It is suggested that a cycle similar to the Szent-Gyorgyi dicarboxylic acid cycle or the more extended citric acid cycle of Krebs (E. S. R., 89, p. 147) was an integral part of the respiratory system and that it was essential for salt accumulation. The K salts of the several organic acids greatly increased Br accumulation; this was shown to be due to the K rather than to the acid anions.

Estudos sôbre a conservação de sementes.—I, Respiração de sementes de algodão em diversas umidades relativas [Studies on the preservation of seeds.—I, Respiration of cottonseeds under various relative humidities], C. M. Franco (*Bragantia, 3 (1943), No. 6, pp. 137–149, illus. 3; Eng. abs., p. 145*).—In studies of cottonseeds subject to relative humidities of 10–100 percent, respiration became noticeable above 80 percent. Seeds held under relative humidities of 0–90 percent had moisture contents of 1.1–20.97 percent.

Effect of intermittent irradiation on photoperiodic responses, R. B. and A. P. Withrow. (Ind. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 1, pp. 6–18, illus. 4*).—The results of experiments conducted by methods described in detail show that: (1) The region of saturation of the photochemical reaction for most of the plants used was in the neighborhood of 1 footcandle, since further increases in irradiance failed to bring about corresponding increases in photoperiodic responses; and (2) the greater the length of the dark period between irridiation cycles, the less was the efficiency of the radiant energy in promoting the long-photoperiod responses, with the efficiency falling off rapidly when the dark periods were around 90 min. or longer for spinach and Biloxi soybean.

From these results, a theory is postulated concerning the kinetics of the photoperiodic reaction, based on two relationships which appear to limit the photochemical reaction, viz, (1) the relatively slow rate of the nonphotochemical reaction which forms the substance to be photoactivated and (2) the relatively low equilibrium concentration which this substance attains during long periods of darkness.

Relation of light to growth of plants, H. F. Thut and W. E. Loomis. (Iowa Expt. Sta.). (*Plant Physiol., 19 (1944), No. 1, pp. 117–130, illus. 8*).—Measurements of the combined elongation of the central axis and a young leaf in corn, of the axis in asparagus and *Polygonum convolvulus*, and of leaf-blade expansion in castor-bean were made on field-grown plants. In most cases the combined effects of cell division and enlargement were included in the "growth" measurements, but in the larger leaves of castor-bean cell expansion alone was probably concerned. All measurements showed a tendency for size increases to follow the temperature curve and thus, with other factors equal, to be increased in sunlight. Growth was checked, however, by internal water deficits, which were generally inversely proportional to relative humidity and available soil moisture and directly so to light intensity, temperature, and air movement. In numerous individual measurements maximum growth of both axes and leaves occurred with full exposure to sunlight at 10,000 footcandles or more. Full Iowa sunlight appeared to have no direct effect on plant growth; indirectly, it increased growth by accelerating photosynthesis and raising temperature. Growth was decreased by excessive temperature and by internal water deficits developed under the combined effects of sunlight, high absorptive capacity of the air, and decreasing soil moisture. Field-grown plants were less subject to internal water deficits with high soil moisture than greenhouse plants in pots; roots of field plants probably develop a greater absorptive area. Water near the plants was used preferentially, and sharp daytime checks in growth were observed when the principal absorption occurred 2 ft. from the base of plants with roots 3 ft. or more long. Experiments indicating that the expansion of large leaves has the temperature coefficient of a chemical reaction suggest that

auxin action in increasing the plasticity of expanding cells may be more important for cell enlargement than turgor pressure. The plants studied grew more in daytime with temperature as the limiting factor, and more at night when moisture was limiting. Very commonly the interaction of these two factors produced a double peak of early morning and evening growth. There are 23 references.

The classification of inflorescences, H. W. RICKETT (*Bot. Rev., 10 (1944), No. 3, pp. 187–231*).—The terms which have been applied to inflorescences, beginning with Linnaeus, the conceptions which have given rise to them, and a rational terminology based on the progress of scientific knowledge are discussed (120 references). A list of terms applied to inflorescences, with their authors and dates, is appended.

The inferior ovary, G. E. DOUGLAS (*Bot. Rev., 10, (1944), No. 3, pp. 125186, illus. 19*).—The author considers in some detail the many theories that have been advanced since the time of Linnaeus to explain epigyny in plants, including the concept accepted by most investigators that the flower is the morphological homolog of a short shoot, consisting of a determinate stem bearing a collection of leaves or sporophylls, the carpel being regarded as the equivalent of a folded leaf or sporophyll. The author then reviews the import of the recently reemphasized method of comparative vascular anatomy which has furnished criteria for determining when the outer wall of an inferior ovary consists of a truly invaginated axis, and when it represents an adnation of floral appendages. In the former case the stelar bundles, running to the top of the ovary, after giving off traces to the three outer whorls, bend backward, and in the course of their downward descent give off the carpel traces. In the latter case there exist all degrees of fusion between the bundles of adnate floral whorls before the tangential splitting takes place which frees them from each other, but there is no invagination. Thus two types of inferior or semi-inferior ovaries can be demonstrated, but, contrary to popular opinion, the type characterized by a truly invaginated axis is noted thus far only in *Rosa*, *Calycanthus*, the family Santalaceae, and possibly in the Juglandaceae. (280 references.)

Specialization of vessels within the xylem of each organ in the Monocotyledoneae, V. I. CHEADLE. (R. I. State Col.). (*Amer. Jour. Bot., 31 (1944), No. 2, pp. 81–92, illus. 11*).—The primary xylem of 306 species in 34 monocotyledon families was investigated in all organs of the plant, with emphasis on comparing the early and late metaxylem. A single table containing representative combinations of elements summarizes the trends of specialization as drawn from the results and conclusions for all but the annular elements of the entire primary xylem. The origin and general trends of specialization of the vessel throughout the plant having been determined, this element can now be used as another tool in various research problems, especially in those involving phylogeny.

Permanent prestaining in botanical microtechnic, E. B. WITTLAKE. (Ohio State Univ.). (*Ohio Jour. Sci., 44 (1944), No. 1, pp. 36–38*).—In permanent prestaining, as here defined, the bulk material is stained once and the stain used in prestaining becomes the primary stain of the finished preparation. One of the many problems in botanical microtechnic is the proper retainment of safranin when counterstaining with any of the commonly used counterstains, and especially is it difficult to stain plant tissues previously treated with HF. The procedure used and here described in detail was worked out specifically for bluegrass leaves, but it was also successfully employed on other material. Many other tissues not treated with HF were also used, with the result that safranin was retained easily and at high intensity. Furthermore, material permanently prestained by this method can be left in the dehydration alcohols much longer than in regular staining schedules.

Developmental potency, differentiation, and pattern in meristems of Monstera deliciosa, R. Bloch (*Amer. Jour. Bot., 31 (1944), No. 2, pp. 71–77, illus. 11*).—The regeneration and cellular differentiation of surface tissues were studied in natural and artificial wounds of the leaves, petioles, and air roots of this tropical American vine and compared to those normally formed in this and other aroid species.

GENETICS

The incompatibility sieve for producing polyploids, D. Lewis (*Jour. Genet., 45 (1943), No. 3, pp. 261–264*).—Heat shocks applied to pollen mother cells, followed by self-pollination, proved effective in producing triploids in fruit trees. The method depends on the sievelike action of incompatibility on the pollen, allowing only diploid pollen tubes to reach the ovary, although much of the pollen is haploid. Since only pollen grains carrying two different S genes are compatible, the heat shock must be given before these genes segregate. By this method triploids were produced from diploid pears. In diploid cherries, fruits were obtained but the seeds were small and nonviable. In a self-incompatible plum ($2n=32$), fruits and seeds were formed after self-pollination with treated pollen, but the seedlings had the same chromosome number as the parent.

The pigment content of polyploid plants, A. Levan (*Hereditas, 29 (1943), No. 3–4, pp. 255–268, illus. 2*).—With a simple photometric method worked out for determining the pigment content of leaves, analyses were made in 11 genera including diploids-tetraploids (*Secale, Hordeum, Allium, Beta, Melandrium, Trifolium, Linum, Galeopsis*), diploids-triploids (*Phleum, populus*), and whole polyploid series (*Phleum, Allium, Rumex*). In *Beta* and to a less extent in *Linum* analyses were made at different stages of the vegetation period. It was found that diploids usually possessed a higher pigment content per green weight than polyploids; the same condition was found on a dry-weight basis, though the difference was less. On the basis of surface the results were more variable. The water content of the diploids was almost always lower than in the polyploids, and their surface per weight unit was constantly larger. It is concluded that one of the causes of the lower pigment content of the polyploids, and perhaps the most important one, is the greater thickness and consequently smaller surface of their leaves.

The mechanism of c[=colchicine]-mitotic action: Observations on the naphthalene series, A. Levan and G. Östergren (*Hereditas, 29 (1943), No. 3–4, pp. 381–443, illus. 2*).—Besides colchicine, various members of the naphthalene series were tested in this investigation. The activity of the α-derivatives of naphthalene was found to increase with decreases in their water solubility. C-tumor formation was not caused by polyploidy, since it often exhibited some autonomy with regard to c-mitosis—e. g., a different threshold concentration. There were clear indications that the β-derivatives of naphthalene are also active; they differed from the α-derivatives in being active only within a much smaller concentration range. Ethyl alcohol proved antagonistic to colchicine. A comparison between the effects of vapor and solution of acenaphthene indicated that, as compared with water, moist air counteracts c-mitosis but promotes c-tumor formation. Peas were not immune to acenaphthene and napthalene derivatives, but were less sensitive than onion; on the contrary, peas were more sensitive to colchicine than onion. The practical efficiency of c-mitotic substances in producing polyploids was not due to their activity as measured by the threshold of action; important factors for practical purposes are the toxicity of the substance and the relative extent of its effective concentration range. Furthermore, the activity of such substances is not due to their chemical attributes, but chiefly or exclusively to their physical properties (as is the case with narcotics),

though there may be exceptions. The Meyer-Overton theory of narcosis may also hold for c-mitotic substances, i. e., their decisive concentration may be that in the lipoid rather than in the aqueous phase of the cells. As an alternate theory, it is possible that the primary feature in c-mitotic action lies in a condensing of lipoid coacervates; this would explain the antagonistic action of ethyl alcohol. C-mitosis resembles narcosis not only in its physical causation but also in its reversible effects on certain life processes while others go on in a pratically normal manner. C-mitosis may be a kind of narcosis, as also may be true for c-tumor formation. Mitochondria or centromeres are suggested as the possible location of c-mitotic action. It appears probable that the similarity sometimes suggested between c-mitotic and carcinogenic substances may also be due to a similarity in physical properties. Some indications were found that both groups of substances may induce "dauermodifications"; it is suggested that cancer may arise as a cell change of this type. There are 205 references.

Studies of asynapsis in rye, R. PRAKKEN (*Hereditas, 29 (1943), No. 3–4, pp. 475–495, illus. 21*).—In a case of monofactorial recessive asynapsis in rye studied in three generations, zygotene-pachytene pairing in the pollen mother cells was found to be complete. A decreased number of chiasmata was formed and during diplotene-diakinesis many pairs fell apart to univalent pairs. In I–M rod bivalents of highly asynaptic plants, probably most of the connections (chiasmata) were between the arms with a heterochromatic end region. The mean number of bivalents per cell at I–M in nine plants ranged from 2.38 to 4.98, and in a nearly parallel manner the percentage of rings among the bivalents ranged from 9.68 to 29.35. These differences between the asynaptic plants were at least in part due to external conditions—primarily atmospheric and soil moisture. Within each plant or group of similar plants the mean percentage of rings among the bivalents was about the same in each of the cell categories with 1–7 bivalents. Intercell variance in number of chiasmata was not significantly higher than intracell variance. A quite normally developed spindle controlled the first meiotic division; in one plant with high asynapsis more than half of the univalents divided longitudinally. The interphase usually showed two cells with one nucleus each, micronuclei being rather rare. In the very irregular second division numerous lagging chromosomes occurred and the "tetrads" contained many extra micronuclei or microcytes. Pollen fertility in the asynaptic plants lay between 1 and 59 percent; in their normal sister plants, between 55 and 99 percent. Embryo-sac mother cells showed the same asynapsis as the pollen mother cells. There are 39 references.

Genetical and physiological studies in interspecific wheat crosses, I. GRANHALL (*Hereditas, 29 (1943), No. 3–4, pp. 269–380, illus. 16*).—These investigations comprise a large number of crosses between species of *Triticum* and derivatives of such combinations. The seed-setting of the reciprocals of artificial crosses between *vulgare* ($2n=42$) and *turgidum* ($2n=28$) was best with the high-chromosome parent female; the same result was also obtained in other pentaploid crosses. Germination and viability of the F_1 in *vulgare* × *turgidum* and other pentaploid crosses were also best with the hexaploid parent female. Hybrid vigor was observed in the F_1 of *vulgare* × *turgidum*. The chromosome numbers in F_2 in *vulgare* × *turgidum* showed a distribution similar to that observed by previous autohrs in other pentaploid wheat crosses. On account of the peculiarities of the frequency curve, intense elimination of univalents and sterile combinations seemed to occur, as in *vulgare* × *durum*. After a number of generations the euploid chromosome numbers of the parents were restored in the progenies of *vulgare* × *turgidum*, but the constant tetraploid stage was obtained considerably quicker than the constant hexaploid stage. A constant 44-chromosome plant was found in F_8, and some other aberrant numbers were

also observed in different crosses. Segregation of beardedness and ear pubescence in F_2 proved monofactorial. The occurrence of *speltoides* and *contractum* forms in the progeny of *vulgare* × *turgidum* is discussed. Crosses between *spelta*, *speltoides*, and homozygous speltoid mutants (A-type) showed the close relationships of the three forms. A new case of "shift" was observed in the tetraploid cross *turgidum* × *contractum*.

Physiological studies were made on a large number of tetraploid and hexaploid lines of *vulgare* × *turgidum* and related crosses. When a hardy *vulgare* variety was crossed with a less hardy *turgidum*, the hexaploid derivatives were less hardy than *vulgare* but considerably more so than the tetraploid derivatives, and the latter were usually more sensitive than the *turgidum* parent. When a comparatively hardy *turgidum* was crossed with a less hardy *vulgare*, the hexaploid lines also tended to greater hardiness than the tetraploids, though they were not as hardy as the parents. The superiority of the hexaploids is explained by the qualitative effects of a large number of hardiness genes distributed over all the three wheat genomes, and by a quantitative accumulation of such gene effects in the higher polyploid forms. The inferiority of the hexaploid lines to the *vulgare* parents, and usually also of the tetraploid lines to the *turgidum* parents, is believed due to disturbances in the "total gene interaction," involving the whole gene mass and its regulation of the more complicated physiological processes. The results of the freezing trials and the assumption of disturbed balance in the new lines were confirmed by field observations on germination and overwintering; the balance seemed to be improved in derivatives of backcrosses and similar combinations. The especially defective germination and winter-hardiness in pentaploid lines were ascribed to cytological irregularities. In the derivatives of *vulgare* × *turgidum*, a positive correlation was established between cold resistance on the one hand and sugar content and osmotic pressure on the other. In pure *vulgare* and *turgidum* varieties a positive correlation was established between cold resistance and viscosity of protoplasm; in *vulgare* × *turgidum* derivatives the centrifuging method showed no differentiation. The tetraploid derivatives were considerably later in time of heading than the hexaploids on account of multifactorial segregation. The tetraploid lines were more resistant to stripe rust and black stem rust but were more susceptible to bacterial black chaff than the hexaploid lines. The segregation appeared to be multifactorial and especially connected with the C genome. Unbalance in the "total gene interactions" failed to find such an evident expression in the developmental rhythm or in the resistance to diseases as it did in cold resistance and germinability. The first-named characters are said to be less complicated in a genetic and physiologic sense and thus less influenced by the total physiology of the plant. There are 135 references.

Inheritance of male sterility in the onion and the production of hybrid seed, H. A. Jones and A. E. Clarke. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 189–194, illus. 2*).—This paper describes the mode of inheritance of male sterility in the onion, which was found to be partly cytoplasmic and partly nuclear in nature, and discusses how this male sterility character may be used in the production of hybrid seed.

The genetics of certain common variations in coleus, D. C. Rife. (Ohio State Univ.). (*Ohio Jour. Sci., 44 (1944), No. 1, pp. 18–24, illus. 1*).—Leaf patterns in coleus are due to the homozygous state (*tt*) of a pair of alleles. The heterozygous state (*Tt*) produces mottling or speckling, and the other homozygous state (*TT*) results in solid green. Solid green due to gene p^G is epistatic to both *Tt* and *tt*, while *Tt* and *tt* are epistatic to *p*. Four genes, either closely linked or belonging to the same allelic series, are responsible for variations in leaf lobes and male sterility. Purple lower epidermis of leaves is dominant to green, solid green leaf color is dominant to white or pink spots, and faint leaf patterns

appear to be dominant to distinct leaf patterns . At least 8 sets of alleles are indicated as being responsible for the variations discussed in this paper. Of the 28 possible linkage relationships 11 were tested; in no case did the ratios obtained deviate significantly from what would be expected on the basis of random assortment, thus giving no indication of linkage.

Einleitende Versuche über Rassenbildung bei Uromyces fabae (Pers.) de By. [Preliminary experiments on race formation in U. fabae], J. Kišpatić (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 475–483, illus. 5*).—From three different German sources, 16 single-spore lines of this rust fungus were obtained and tested on 14 varieties of broadbean. By this means it was shown that *U. fabae* also breaks up into physiological races.

The breeding structure of the Aberdeen-Angus breed, H. H. Stonaker. (Iowa Expt. Sta.). (*Jour. Hered., 34 (1943), No. 11, pp. 322–328, illus. 3*).—Continuing investigations by Carter of the genetic history of breeds of livestock (E. S. R., 83, p. 179), study was made, by methods of sampling employed by Wright and McPhee (E. S. R., 54, p. 324), of the breeding structure of Aberdeen-Angus cattle born in the United States. The inbreeding percentages (from 1900 to 1939) calculated by 10-yr. periods range from 8.9 to 14.2. The inbreeding expected from inter se relationships was only about 62 percent of that actually found. There was thus a slight tendency for mates to be more closely related to each other than when mating was entirely at random. About 10 percent of the average of 0.3 percent rise in inbreeding per generation resulted from the partial isolation of herds. The average interval between generations was nearly 5.4 yr. The breeding systems in the Aberdeen Angus were much like those of other cattle breeds. The relationships of outstanding animals to the breed were tabulated. According to a random sample made in 1939, six sires and eight dams contributed about half the ancestry of the breed.

Survival of multiple pregnancies induced in the ewe following treatment with pituitary gonadotropins, L. E. Casida, E. J. Warwick, and R. K. Meyer. (Wis. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 22–28*).—Treatment of 25 ewes by methods similar to those previously noted with cattle (E. S. R., 89, p. 44) induced superovulation. These ewes were mated or artificially inseminated. Observations on the viability of the embryos at different intervals showed that at 2–5 days an average of 9.2 normal embryos was recovered in 6 pregnancies. As gestation advanced viability was rapidly reduced so that after 14–27 days an average of 3.4 normal embryos was recovered in 8 pregnancies. After 30–37 days an average of 0.8 normal embryo occurred in 5 pregnancies. It seemed evident that although superovulation was induced viability was reduced. To make observations on the causes of low viability in the large litters transplantation of embryos from the large litters to normal ewes was attempted, but only 3 of the fetuses survived long enough to prevent the next heat period and, therefore, no conclusion was possible as to the cause of excessive mortality.

The genetic sex of intersexual goats and a probable linkage with the gene for hornlessness, S. A. Asdell. (Cornell Univ.). (*Science, 99 (1944), No. 2563, p. 124*).—Evidence is cited that hornlessness in goats is closely linked with intersexuality. Thus by selecting for hornlessness the frequency of intersexuality (E. S. R., 82, p. 173) was increased.

Some anomalies in pigs, E. J. Warwick, A. B. Chapman, and B. Ross. (Wis. Expt. Sta.). (*Jour. Hered., 34 (1943), No. 11, pp. 349–352, illus. 2*).—Various abnormalities were found in swine herds which were evidently hereditary and associated, but the exact mode in inheritance was not ascertained. A hydrocephalous condition, with rudimentary tail, occurred in a Duroc-Jersey herd. Thick forelegs with several abnormalities, such as atresia ani, hernia, hair whorls, front and hind leg deformities, and cryptorchidism, occurred in Chester-

White pigs. A hydrocephalous condition, cryptorchidism, frontal bone fissure of the skeleton, and cleft palate were observed in pigs of the Poland-China herd. The association of these conditions was not clear.

The inheritance of coat and nose colour in long-haired Dachshunds, A. J. Lea (*Jour. Genet., 45 (1943), No. 2, pp. 197–205, illus. 1*).—From study of the coat and nose colors of long-haired Dachshunds, three pairs of allels seemed responsible for coat color—brindle and its absence, red and its absence, and black and tan and chocolate and tan, with the dominant mentioned first. Red was epistatic to black and tan, and brindle was epistatic to the other two pairs of genes. The expected values of p for recessives in the various crosses were brindle × red, 0.5; brindle × black and tan, 0.5; and brindle × brindle, 0.25 and 0.5, respectively, when homozygous and heterozygous. The data were obtained from breeders by personal observation.

Variations in the nose color were associated with the various environmental conditions as well as the characters of the dogs.

A four-legged ring-neck pheasant chick, T. H. Bissonnette (*Jour. Hered., 34 (1943), No. 11, pp. 345–348, illus. 2*).—Anatomical relationships in an abnormal ring-necked pheasant chick involving nearly complete reduplication of the pelvic girdle and attached limb skeleton, with a single vertebral column not bifurcated posteriorly, is described. Photographs made in transmitted light show vertebral and other bone relationships. Evidently the condition resulted from the accidental transplantation of limb-field material or its separation into two parts in series along the axis of symmetry.

Study of various factors affecting permeability of birds' eggshell, A. L. Romanoff. ([N. Y.] Cornell Expt. Sta.). (*Food Res., 8 (1943), No. 3, pp. 212–223, illus 4*).—Study of the permeability of shells of 1,307 White Leghorn eggs in a specially perfected apparatus for measuring passage of pure gases (oxygen, nitrogen, carbon dioxide, and hydrogen) showed that the egg is more permeable at the blunt end than at the sharp end. The ease of permeability has a direct relationship to the amount of water retained in the pores. Increases at the blunt end and decreases at the sharp end occurred with successive eggs during the laying cycle. The permeability had no relationship to breaking strength or thickness of the shell. It was found to increase with embryonic development more rapidly at the blunt end than at the sharp end, and the shell was more permeable to nitrogen, carbon dioxide, and hydrogen and less permeable to oxygen than to air. The permeability increased with age at high humidity and high content of carbon dioxide. It was higher in large eggs, like those of geese, and lower in small eggs, like those of grouse and quail.

Physiology of development of the feather.—VII, An experimental study of induction, F. R. Lillie and H. Wang (*Physiol. Zool., 17 (1944), No. 1, pp. 1–31+, illus. 27*).—New types of experiments, including grafting of selected parts of the papilla to host papillae, were employed in further investigations of feather development (E. S. R., 89, p. 46). A graft from the dorsal half of the papilla inserted into the ventral surface of the host papillae induces a separate feather. Similar grafts derived from the ventral half of the papilla produced an enlargement of the after-feather but have no inducing power. The study was conducted with Brown Leghorn capons, by methods previously described (E. S. R., 85, p. 467).

Effects of purified antero-pituitary hormones on the carbohydrate stores of hypophysectomized rats, V. V. Herring and H. M. Evans. (Univ. Calif.). (*Amer. Jour. Physiol., 140 (1943), No. 3, pp. 452–459, illus. 3*).—Male and female hypophysectomized rats were injected intraperitoneally with various doses of purified anterior pituitary hormones, and the effects on the carbohydrate stores in the blood were ascertained at varying intervals. About 10 dif-

ferent preparations of growth hormones were given to a total of 64 rats. Different doses from 0.1 to 1 mg. of highly purified growth hormones caused statistically significant maintenance, but higher doses were not more effective than 0.1 mg. It appeared that the crude preparations of the anterior hypophysis extracts and the highly purified growth-promoting extracts showed the greatest myoglycostatic activity. The activity of the impure thyrotropic extracts was no greater than that expected from the possible growth hormone contamination. Adrenocorticotropic hormones showed only slight or no activity during the 1-day test when growth hormone preparations were highly effective. However, with longer administration of adrenocorticotropic hormone, muscle and hepatic glycogen were not increased and the adrenals were normal or hypertrophied. Pure lactogenic hormone was ineffective in the 1-day myoglycostatic test or when administered for 4 to 14 days. The methods employed were largely those used by Fraenkel-Conrat et al. in earlier studies (E. S. R., 88, p. 471).

The relation of longevity to fertility of bull semen, S. Margolin, J. W. Bartlett, and O. L. Lepard. (N. J. Expt. Stas.). (*Jour. Dairy Sci., 26 (1943), No. 11, pp. 983–985*).—Motility measurements at 24-hour intervals of 207 normal semen samples from 10 bulls in the New Jersey Artificial Breeding Unit No. 2 showed a significant correlation between longevity and conception rate of 0.6964±0.0212. Of 483 services of 306 normal cows with fresh and 1-day semen samples, all conceived with two services. There were only slight differences in the percentage conception from fresh and 1-day samples. Six of 8 sires showed significant positive correlations between longevity and conception rate, but the correlation was insignificant with 2 sires. Motility was observed in only 3 of 483 samples kept longer than 14 days.

The effect of dilution rate on the livability and the fertility of bull spermatozoa used for artificial insemination, G. W. Salisbury, G. H. Beck, P. T. Cupps, and I. Elliott. (Cornell Univ.). (*Jour. Dairy Sci., 26 (1943), No. 11, pp. 1057–1069*),—A decrease in motility of bull sperm occurred with increases in dilution from 1 part of semen to 1 part of yolk citrate up to 32 parts of diluter, with storage at 5° C. Higher concentrated semen with actively motile sperm survived storage at higher dilutions better than semen of lower sperm count and of lower initial motility. In 3,940 artificial services in field studies with 17 Holstein and 11 Guernsey bulls, in cooperation with the New York Artificial Breeders' Cooperative, dilutions of the semen from 1:2 to 1:14 resulted in 53.4 percent conceptions. There were no significant differences in the fertility obtained from the semen of 6 bulls diluted at rates of 1 part of semen to 4, 6, 8, 10, 12, and 16 parts of yolk citrate. During 4 days' storage there were no significant differences in conception rates, but there were too few inseminations with samples stored longer than 4 days.

Electron microscope study of sperm, M. R. B. Baylor, A. Nalbandov, and G. L. Clark. (Univ. Ill. et al.). (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 2, pp. 229–232, illus. 7*).—Continuing studies of morphological changes in sperm with age, by Nalbandov and Card (E. S. R., 89, p. 305), sperm from fertile bulls observed under the electron microscope showed that the anterior portion of the sperm head is always enveloped by a protoplasmic cap which appears damaged or disappears altogether if stained or fixed. Thus the protoplasmic cap is not a sign of immature or abnormal sperm but is typical of normal sperm when they are examined without exposure to solvents usually present in stains. Evidently the tails consist of a bundle of fine fibers rather than a relatively thick thread.

The influence of different amounts of illumination upon the production of semen in the fowl, W. F. Lamoreux. (Cornell Univ.). (*Jour. Expt. Zool., 94 (1943), No. 1, pp. 73–95, illus. 3*).—The size of the testes and the semen

production of White Leghorn cockerels were greatly influenced by differences in the length of daily exposure to light periods. Over 12 hours' exposure daily caused significantly greater gains in the yields of semen than daily exposure to light of 1 hr. or less. Only very slight and insignificant differences were observed by groups exposed for 14 hr. daily to different intensities of light for a period over 2.5 mo. Maximum response to light stimulation was obtained in about 1 mo. Evidently environmental conditions other than light also influenced semen production. There were employed in this study groups of dubbed White Leghorn cockerels consisting of 36, 53, and 83 cockerels exposed to different daily treatments with light from less than 1 hr. to 9, 12, 14, 16, or 24 hr. per day, with about 6 individuals per lot. Semen samples were obtained by methods previously employed (E. S. R., 87, p. 364).

Study of the crop-sac weight method for prolactin assay, S. R. Hall. (U. S. D. A.). (*Endocrinology, 34 (1944), No. 1, pp. 1–13, illus. 2*).—Study of the pigeon crop-sac method of assaying prolactin by Bates et al. (E. S. R., 83, p. 478) showed this method to be valid only when there were produced crop sacs weighing more than 2,200 to 2,500 mg. A significantly flatter curve resulted below this level of response. In certain proportions muscle extracts augmented the responses, but other proportions depressed them. Subcutaneous administration gave about 50 percent greater response than intramuscular administration. Males responded slightly more than females to subcutaneously administered prolactin, but there was no sex difference to intramuscular doses. Wide variations were observed in the crop-sac responses of 6-week-old pigeons to the same prolactin preparations at different times during the year, but the variations were less with the responses below 2,300 mg. than above this level. The study was based on the crop-sac responses of 561 6-week-old White Carneau pigeons to 5 prolactin preparations administered 53 times during the year.

Prolactin assay by a comparison of the two crop-sacs of the same pigeon after local injection, S. R. Hall. (U. S. D. A.). (*Endocrinology, 34 (1944), No. 1, pp. 14–26, illus. 3*).—Prolactin potency of different doses was compared on the two crop-sacs of the same young pigeon. A 20-perecnt change in the dosage was detected in both the 2- and 4-day tests, but a change of 100 percent in dosage was not uniformly detected. Responses in the test varied with the location of the injection and the volume of solution used. Nearly equal responses were produced by both subcutaneous and intradermal administrations. Greater action was obtained with suspensions of acetone-dried or fresh tissues than from extracts. The volume of extracting fluid was not a factor affecting response. Two samples of acetone-dried pituitary tissues, one one-half as potent as the other, were not distinguishable when administered as suspensions, but gave the expected reactions when administered as extracts. Pituitary prolactin potencies were from 5 to 10 times those reported for several species from the Missouri Experiment Station.

FIELD CROPS

Reliability of the line interception method in measuring vegetation on the southern Great Plains, K. W. Parker and D. A. Savage. (U. S. D. A. coop. Okla. Expt. Sta. et al.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 97–110, illus. 1*).—The line-transect method of determining density and botanical composition of native range vegetation, when kept carefully standardized by repeated checking of procedures, according to studies at Woodward, Okla., represents a desirable combination of speed and accuracy. The technic appeared to be well suited for use on the sand dune sage type of the southern Great Plains.

Prairie studies in west-central Kansas, 1942, F. W. Albertson (*Kans. Acad. Sci. Trans., 46 (1943), pp. 81–84, illus. 2*).—In view of the great variation

in basal cover and composition observed over many years in the pasture lands of west-central Kansas, the author reports briefly on the yields of prairie grasses on the various grazing types common to this section of the State and with special reference to the short-grass, little bluestem, and big bluestem types.

The effect of some environmental influences in bulk hybridization of grass, J. W. CLARK. (Utah Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 132–140, illus. 1*).—Experiments involving smooth bromegrass and crested and western wheatgrasses provided evidence supporting findings of others that a differential exists in the thermal death points of male and female gametophytes. It is best demonstrated by hot water treatment at 47° C. for 5 min. just before normal anthesis. Hot water emasculation at 45°, 46°, and 47° hourly from 6 a. m. to 6 p. m. revealed that treatments at 12 m. were less injurious to the plant than treatments in early morning or late afternoon. A treatment of 45° at 6 a. m. appeared to give as effective an emasculation as one of 47° at noon. None of five methods of controlled pollination tested gave satisfactory seed yields. Low seed yields obtained resulted from some factor or combination of factors other than emasculation treatment, since similarly treated inflorescences exposed to continuous wind pollination (not bagged) made satisfactory seed yields. Air temperatures within isolation bags were about 2° higher than those outside the bags.

Effectiveness of renovation in increasing yields of permanent pastures in southern Wisconsin, H. L. AHLGREN, M. L. WALL, R. J. MUCKENHIRN, and F. V. BURCALOW. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 121–131*).—Renovated pastures (E. S. R., 83, p. 55) in Richland County within the slope classes of from 15 to 25 percent and from 26 to 35 percent each provided 176 cow-pasture days per acre in 1941 and 102 and 88 cow-pasture days per acre, respectively, in 1942. Untreated pastures within the 15–25 percent and 26–35 percent slope classes provided grazing at the rates of 83 and 35 cow-pasture days per acre, respectively, in 1941 and 72 and 60 cow-pasture days per acre, respectively, in 1942. Renovated pastures within the 15–25 and 26–35 percent slope classes averaged 5,075 and 5,019 lb. of dry matter per acre, respectively, in 1941 and 3,887 and 3,000 lb. of dry matter per acre, respectively, in 1942. Untreated pastures within these two slope classes averaged 1,501 and 920 lb. of dry matter per acre, respectively, in 1941 and 2,109 and 1,465 lb. of dry matter per acre, respectively, in 1942. Production from the six renovated pastures was more uniformly distributed throughout the growing period than that of the six unimproved pastures.

Legumes, particularly sweetclover, dominated other vegetation in renovated pastures in 1941. Dominant vegetation in renovated pastures in 1942 was Kentucky bluegrass, red clover, and redtop. Kentucky bluegrass and redtop provided an average of only 19.4 percent of the total number of hits (on a frequency basis) in renovated pastures in 1941 and 65.2 percent in 1942. Weed growth and white grubs were reduced effectively by renovation. In the six renovated pastures the number of weeds was 66.1 percent less in 1941 and 74.9 less in 1942 than in untreated pastures, and the white grub population was 70.6 percent lower in 1941 and 56.8 lower in 1942.

Relative palatability of eight grasses used in range reseeding, R. M. HURD and C. K. PEARSE. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 162–165, illus. 2*).—Tall oatgrass, smooth bromegrass, orchard grass, slender wheatgrass, and mountain brome were the most palatable of eight species studied in the mountain brush zone at an elevation of 5,200 ft. near Ogden, Utah. Crested wheatgrass, bluestem wheatgrass, and bearded bluebunch wheatgrass were less palatable and were sought by steers in the order given.

Use of root pressures in determining injury to roots by cultivation, O. A. LEONARD. (Miss. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 1, pp. 157–163*).—A method of measuring injury (comparatively) to crop roots by cultivation described involves use of changes in positive root pressures before and after cultivation, with a standardized interval of 2 min. between readings. Results are calculated as percentage changes in root pressure. Decrease in root pressure in cotton plants is somewhat proportional to the quantity of xylem cut. Maximum reduction in root pressure occurs directly after cultivation. After 1 day reduction in root pressure is much smaller, and after 7 days there is no reduction in root pressures when compared with uncultivated cotton. A week evidently is enough to stop loss of water from cut roots.

Effectiveness of calcium metaphosphate and fused rock phosphate on alfalfa, F. J. ALWAY and G. H. NESOM. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 1, pp. 73–88, illus. 2*).—Applied on plowed Clarion clay loam, in advance of seeding, calcium metaphosphate increased alfalfa yield as much as superphosphate in each of the following three crop seasons. Spring top-dressed on the established stand, metaphosphate was far inferior in the first season but almost equal to superphosphate in the second. Applied at a rate giving as much citrate-soluble and considerably more total P_2O_5, and worked in before seeding, fused rock phosphate caused larger yields than the other phosphates throughout 3 yr., but showed little or no benefit as a top dressing. In 16 counties in western Minnesota, where lime deficiency is rare, calcium metaphosphate alone as a spring top dressing on alfalfa in established fields and also newly sown with small grains gave slight benefit in the first season but much greater in the second. Calcium metaphosphate and fused rock phosphate apparently will be as effective as superphosphate when well incorporated with the soil in advance or at time of planting of crops, at least on all but calcareous soils.

A source study of blue grama grass and the effect of different treatments on establishing stands of grass under field conditions at Hays, Kansas, D. A. RIEGEL (*Kans. Acad. Sci. Trans., 46 (1943), pp. 102–109, illus. 3*).—Seed from 10 sources in the Great Plains region were planted and subjected to six different experimental treatments involving weed competition and grazing or clipping. The Texas source appeared to suffer most damage and the two North Dakota sources least. After the seedlings had produced three or more leaves they ceased to be eaten to any extent by grasshoppers. Excellent stands were usually obtained where cultivation before planting had killed the weeds and destroyed the shelter of grasshopper nymphs. The stands without seedbed preparation were mostly sparse because of grasshopper competition and shading. On August 1, grass roots from most seed sources had penetrated 3 ft. downward (northern sources 2 ft.) where the seedbed had been cultivated and frequent clipping had removed the weeds. In the unclipped plats of the southern and central sources on which the weeds had not been killed before planting, root systems were restricted to 2 ft. or less in length. The number of tillers per plant on August 1 was greatest where the seedbed had been tilled before planting and least for all sources where neither clipping of weeds nor seedbed preparation had been practiced. At this date the leaves from southern sources were about 5.5 in. long; those from northern sources, 2 in. Weeds were consistently more numerous where there had been no precultivation; clipping aided materially in reducing competition from weeds, frequent mowing near the surface practically eliminating it. The northern sources began to flower 7 weeks after planting; a month later all sources were in bloom. The southern sources attained a height of about 16 in., the central 14 in., and the northern sources 8 in. Where the weeds had been killed prior to seeding, the southern sources gave the best ground cover

and the northern the least. Where the seed had been planted in weedy untilled soil and the weeds clipped, the northern source increased in cover more than the above treatment and even exceeded the central and southern sources. All sources produced very little cover under the unclipped-uncultivated treatment, competition of grasshoppers, shading, and insufficient moisture causing great mortality. Better results will apparently follow destruction of weeds by cultivation before planting if seeding is to be done late in the spring. Northern blue grama grass appeared more resistant to grasshopper damage than that from central or southern sources and established itself better under weeds if they were mowed occasionally during the first growing season. Where weeds were numerous and were neither destroyed before seeding nor clipped afterward, the grass seedlings from any source had little chance of becoming established.

The effect of season of growth and clipping on the chemical composition of blue grama (Bouteloua gracilis) at Hays, Kansas, N. R. Runyon (*Kans. Acad. Sci. Trans., 46 (1943), pp. 116–121, illus. 2*).—The tendency of blue grama grass to become unpalatable to livestock was indicated in the analyses presented by the decrease in moisture, protein, and N-free extract and the increase in fibrous material in the first clippings. The second and recurrent clippings were a deciding factor in retaining more water and protein. This may answer the question as to why cattle graze some areas short while other areas are untouched, and it has a direct relation to the frequency of loss in weight of cattle in late summer. According to Watkins (E. S. R., 77, p. 522), best results with cattle are obtained when their forage contains about 0.25 percent Ca and 0.12 percent P; on this basis cattle wintered on blue grama should be supplied with a supplement rich in Ca, P, and protein. The practice of deferring pasture until August 1 or withholding stock from the range until that time is believed hardly justifiable except where revegetation has become necessary, because much of the value of the forage is wasted under such a procedure. There are 18 references.

Yield and bushel weight of corn grain as influenced by time of planting, G. H. Dungan. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 166–170, illus. 1*).—Yield and quality tests of 7 short-, 11 mid-, and 5 full-season open-pollinated corn varieties planted at three different dates in northern (DeKalb) and central (Urbana) Illinois were made, 1927–31. An intermediate planting date proved best for short-season varieties at DeKalb. Early planting of full-season varieties gave best yields in both locations. At DeKalb May 27 planting reduced yield 2.2 bu. under May 11 planting, and June 7 planting reduced it 10.3 bu. At Urbana May 21 planting reduced yield 4.9 bu. under May 2 planting, and June 11 planting reduced it 22.3 bu. Quality of grain as measured by bushel weight and percentage of water-free shelled corn was reduced by delayed planting in all cases. Since late planting has detrimental influence on yield and quality of the crop, use of this method for reduction of insect and disease damage apparently should be adopted with some caution.

Cotton variety tests in Georgia, 1938–1943, R. P. Bledsoe, W. W. Ballard, and A. L. Smith. (Coop. U. S. D. A.). (*Georgia Sta. Cir. 144 (1944), pp. 7*).—Tests at four locations in north Georgia and three locations in south Georgia during 1943 are tabulated, with averages for the period 1938–43.

During the 2-yr. period 1942–43, strains of Empire cotton led other varieties in money value, but with relatively small differences from the five varieties of Coker cotton. In 3-yr. averages in south Georgia, Coker 100 Wilt appeared somewhat superior in yield and money value, had a fiber length of about 1 in. under most conditions, and was thought to be an improvement over other wilt-resistant varieties. Stonewilt 2, tested for only 2 yr., appeared to be of about equal value. For Coastal Plain soils known to be wilt-free or lightly infested, Deltapine or Stoneville are suggested.

Cotton varieties in the hill section of Mississippi, 1943, J. F. O'Kelly (*Mississippi Sta. Bul. 396 (1944), pp. 8*).—Yields obtained in tests at six locations in 1943 are tabulated, with averages for 1939–43. Hi-Bred led in lint percentage at all locations and in pounds of lint per acre in all locations except Holly Springs, where it was exceeded by Acala 892 and Miller on the hill soils, and by Deltapine 14 and Stoneville 2B on the valley soils. Delfos 531 and Express 11384 led in staple length with $1\frac{5}{32}$ in.

Influencia de la reaccion del suelo sobre el rendimiento de un ensayo de linos oleaginosos [Influence of soil reaction on yields in an experiment with linseed flax], R. H. E. Molfino (*Univ. Nac. La Plata, Rev. Facult. Agron., 3. ser., 25 (1940) (pub. 1943), pp. 141–174, illus. 9; Eng. abs. pp. 172–173*).—In this 1940 test, the linseed varieties Buck 3, Buck 113, and Buck 114, of similar genetic and geographical origin, increased in yield with rise in soil pH values, whereas the yield of H 39 decreased under the same conditions. The varieties 330 M. A. and Querandí M. A., also of like genetic and geographical origin, appeared to give their optimum yields at pH 6.1. All 12 varieties tested except H 39 gave higher yields at the medium reaction of pH 6.5. The unfavorable influence of low pH values was more conspicuous than the favorable influence of high pH values, but it is believed that soil reaction should not be a matter of concern at values of pH 6.1–6.7. H 39—the only acidophilous flax found—originated in a section where soils are more acid than in the remainder of the Argentine linseed flax belt. According to analysis of variance, the yields in this experiment were determined in decreasing order of importance by soil reaction, variety, and by the soil itself. In other words, though soil reaction had the greatest influence on yields, the soil and subsoil moisture and fertility were also not without effect and the varieties tended to behave toward soil reaction according to the pH values of the region from which they originated.

Resultados de un cuadrienio (1938–1941) de ensayos de linos oleaginosos en La Plata [Results of a four-year trial (1938–41) of linseed flax in La Plata], A. L. De Fina and R. Castells (*Univ. Nac. La Plata, Rev. Facult. Agron., 3. ser., 25 (1940) (pub. 1943), pp. 55–59*).

We're learning about hemp, C. P. Wilsie and C. A. Black (*Farm Sci. Rptr. [Iowa State Col.], 5 (1944), No. 1. pp. 16–19, illus. 8*).—Productive practices for growing hemp, indicated by Iowa Experiment Station experiments in 1943, include planting between April 25 and May 15, drilling if possible, use of 5 pk. of seed per acre, fertilizing with about 500 lb. of 10–6–4 fertilizer, use of about 200 lb. of 0–20–0 or 4–16–4 where additions of manure or legumes have provided a high N level in the soil, harvesting about September 1, and turning partially retted hemp in the swath by early October. When hemp yields after clover and alfalfa were considered 100, relative yields after soybeans were 75, corn-oats 57, and sorghum 35, in accordance with their effects on available soil N. Beneficial effects of alfalfa persisted into the second hemp crop, while hemp grown the second year after clover was plowed under was much poorer—about equivalent to hemp the first year after soybeans. With soybeans practically all beneficial effects were obtained in the first year.

Peanuts: A war crop on Alabama farms, A. H. Harrington, P. E. Jones, and W. F. Lagrone. (Coop. U. S. D. A.). (*Alabama Sta. Agr. Econ. Mimeog. No. 1 (1943), pp. 27+, illus. 3*).—This report was prepared to help farmers complete their 1943 plans and is based principally on experiences in 1942 as developed from a mailed questionnaire. More specific data regarding labor requirements, costs, and returns were secured in Henry and Marshall Counties through interviews with producers.

Potato production in Kansas (*Kansas Sta. Bul. 322 (1944), pp. 51+, illus. 19*).—This manual is in three parts: (1) Production and Cultural Practices, by

S. W. Decker (pp. 5–25); (2) Potato Diseases and Their Control, by O. H. Elmer (pp. 26–44); and (3) Common Insects Attacking Potatoes, by G. A. Dean (pp. 44–51).

Rubber from plant sources: Investigations on Cryptostegia, kok-saghyz, and guayule, with a note on synthetic rubber research (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *17 (1944), No. 1, pp. 49–58*).—A survey initiated in 1942 to determine the possibility of producing rubber from indigenous trees and shrubs in Australia disclosed that while there were a number of indigenous plants containing latex with rubber, none was sufficiently attractive to warrant exploitation. An introduced plant, *C. grandiflora*, appeared to be the one rubber-bearing plant already present in sufficient quantity to be readily multiplied and become a source of supply. However, a further detailed study of the situation led to the conclusoin that *Cryptostegia* is too low in rubber content to enable its economic cultivation for this purpose under Australian conditions by any extraction process based on chemical or mechanical methods. Preliminary reports are also included on experimental studies of the possibilities of the Russian dandelion *Taraxacum kok-saghyz* and guayule for Australia, as well as on the progress of synthetic rubber research.

More, better soybeans, C. R. Weber. (U. S. D. A.). (*Farm Sci. Rptr.* [*Iowa State Col.*], *5 (1944), No. 1, pp. 3–6, illus. 4*).—Lincoln, a new soybean variety released for multiplication in Iowa in 1943, derived from a natural cross between a white-flowered Mandarin and Manchu grown by C. M. Woodworth at the Illinois Experiment Station in 1935 and carried forward by L. F. Williams, has a yellow seed with a black hilum, white flowers, tawny pubescence, and resembles Manchu in general habit of growth. Lincoln has outyielded Richland, Mukden, B. H. (Black Hilum) Manchu, Dunfield, and Illini in 3- to 5-yr. tests in northern, central, and southern Iowa. In 61 replicated trials in Ohio, Indiana, Illinois, Iowa, Missouri, and Nebraska, 1938–42, Lincoln has outyielded Illini and Dunfield by nearly 6.1 bu. per acre, or 22 percent. It has averaged a day earlier than Illini, has lodged less than either Dunfield or Illini, and has had superior seed quality. It has surpassed Dunfield, considered outstanding in quality of oil, in percentages of protein and of oil, and drying quality of oil. Current recommendations are that Lincoln be grown in the Iowa counties from Woodbury, Webster, Black Hawk, and Dubuque south and not in any counties north of these. Varieties are recommended for different sections of Iowa, and cultural practices are outlined.

Lincoln, a new variety high in yield and oil content, C. R. Weber. (U. S. D. A.). (*Soybean Digest, 4 (1944), No. 5, pp. 6–7, illus. 4*).—An abridgment of the above article.

Search for suitable varieties in Arizona, T. J. Smith. (Univ. Ariz.). (*Soybean Digest, 4 (1944), No. 5, pp. 15–16, illus. 1*).—Seeking soybean varieties suitable for irrigated areas in the southwest, the Arizona Station has types producing seed of excellent quality in color, size, uniformity, viability, and oil content, although some sorts may contain 25–30 percent of hard seeds. Others yield well but shatter badly under the low relative humidities, and many will not endure the high salt content in certain soils. The better types have consistently produced from 3.5 to 4.5 tons of forage and from 35 to 40 bu. of beans per acre when grown under irrigation at the lower elevations in the State. The best planting period has been between May 15 and June 15. This allows the plants to flower during the period of summer rains and produces a much better yield of higher quality beans. The best yields have been obtained by planting in rows, with seeding rates about twice that normally used in the more humid regions. Consistent nodulation of soybeans could not be had even with inocula-

tion. No differences in plant growth or seed yields were observed between fields nodulated and those not nodulated.

Influence of fertilizer, fertilizer placement, soil moisture content, and soil type on the emergence of soybeans, A. H. Probst. (Ind. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 111–120, illus. 4*).—Fertilizers applied to Dunfield soybeans under test conditions, 1939–41, usually inhibited emergence to some extent, but not always significantly, irrespective of the three analyses at six rates, two placements of fertilizers, two soil types, or two soil moisture levels. Emergence was generally inhibited in proportion to rate of application and kind of fertilizer used when applied in contact with the seed. Emergence was not reduced significantly by as much as 375 lb. per acre of 0–20–0 or 0–0–20 or of 125 lb. per acre of 0–20–20 applied in contact with seed on Brookston silty clay loam with a high moisture level at time of planting in either field or greenhouse; or with a low soil moisture content at time of planting by 125 lb. per acre of 0–20–0 or 0–0–20 fertilizer in contact with the seed; or compared with unfertilized plats by 500 and 750 lb. per acre of the three formulas when applied in bands at the side of and on the same level as the seed. Fewer plants emerged at the low than at the high soil moisture content when fertilizer was applied in contact with the seed. With no fertilizer, or fertilizer applied in bands, difference in emergence due to soil moisture content was not so pronounced except under field conditions. The type of soil used, whether Clermont silt loam or Brookston silty clay loam, did not appear to influence emergence definitely, either in presence or absence of fertilizers. Soybeans emerged faster with no fertilizer or with fertilizer in bands than with fertilizer applied in contact with the seed. P fertilizer delayed emergence less and reduced final emergence less than K; in combination they gave cumulative deleterious effects on emergence and rapidity of emergence when applied in contact with the seed.

Field and greenhouse tests with synthetic growth-regulating substances applied to sugar beet seeds and plants, M. Stout and B. Tolman. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 141–146*).—No significant benefits as to seedling emergence of sugar beets, vegetative growth, sucrose content, purity, or yield of roots per acre were derived from any of several treatments applied in greenhouse or field tests. Naphthaleneacetic acid, naphthaleneacetamide, indoleacetic acid, indolebutyric acid, levulinic acid, and two commercial preparations were used in concentrations ranging from 10 to 1,000 p. p. m. in dust treatments and from 2 to 85 p. p. m. in sprays. "The results here reported do not lend encouragement to the use of chemical growth-stimulating seed treatments on sugar beets grown in this area (Utah)."

Germination of the buds of sugarcane, P. J. Mills and J. Dufrenoy. (La. State Univ.). (*La. Acad. Sci. Proc., 7 (1943), pp. 17–19, illus. 1*).—Number of buds which germinated in seven CP varieties of sugarcane decreased from the top down, an evidence of apical dominance. Decrease in frequency of germinating buds from the upper to lower node of the stalk may be represented by use of the regression curve calculated by means of the method of polynomials of Fisher and Yates (E. S. R., 80, p. 572).

Why are single plant yields of sweetpotato highly variable within plots? C. E. Steinbauer, G. P. Hoffman, and J. B. Edmond. (U. S. D. A. and S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 249–254*).—Yields and details of growth of individual sweetpotato plants were recorded on replicate plats set the same day with rooted and nonrooted cuttings from selected and random lots of roots, and set with draws or sprouts from random lots, 1937–38, at Beltsville, Md., Florence, S. C., and Meridian, Miss. Yields per plant were not correlated consistently with kind of propagating piece or portion of mother root furnishing

cuttings or sprouts. Little of the variation in yield per plant could be associated consistently with any evident feature of individual propagating pieces or newly established normal plants in the field.

The effect of exposure to low temperatures on plant production of the Porto Rico sweetpotato, J. B. EDMOND. (Clemson Agr. Col.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 259–261*).—At the end of the regular storage period 1939–43, roots of Unit 1 strain of the Porto Rico sweetpotato were exposed to temperatures of 40° F. for 4, 7, and 14 days. As results of 7- and 14-day exposures, number of plants per root and per bushel decreased, grams of root required to produce unit weight of plant increased, and marked rotting of the bedded roots was induced. Exposure to temperatures below the optimum range in storage for relatively long periods is thus likely to lower plant-producing capacity of roots.

The influence of "crowded" bedding of roots on plant production of the Porto Rico sweetpotato, J. B. EDMOND and G. H. DUNKELBERG. (Clemson Agr. Col.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 246–248*).—Crowded bedding in electrically heated beds (E. S. R., 89, p. 211), consisting of placing about twice as many roots per unit area of bedding space as ordinarily practiced (i. e., 600 v. 300 plants per 36 sq. ft.), markedly increased plant production per unit area of bedding space, but had little effect on characteristics of individual sweetpotato plants and did not materially increase rotting of bedded roots.

Factors influencing the relative humidity of the air immediately surrounding sweet potatoes during curing, J. M. LUTZ. (U. S. D. A.) (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 255–258*).—The humidity of the air immediately around Porto Rico sweetpotatoes well within the standard bushel crate (found by determining the moisture content of viscose filaments) was higher than that of the air of the curing room (outside the crate), but this difference became less as the roots became cured. With air circulation, there was less difference between humidity of the air in the crate and curing room than with no circulation.

The effects of different intensities of grazing upon three varieties of wheat in western Kansas, R. F. ROEMER. (*Kans. Acad. Sci. Trans., 46 (1943), pp. 110–115, illus. 2*).—During the first 4 mo. of growth, plants of the hard winter wheat varieties Turkey, Tenmarq, and Early Blackhull averaged 8–9 tillers and an equal number of crown roots, some of which penetrated to 61 in. During the December–February cold, a few roots penetrated to 72 in., but there was no increase in number of roots or tillers. On March 10, nongrazed plants had the most roots and the overgrazed the fewest by weight in the first foot of soil. Cattle grazed the wheat 190 days beginning November 4, 1941, and clipping was continued on one row of each variety until April 24, 1942, to determine the effect of late grazing on yields. The greatest root penetration was 75 in. and there were no apparent varietal differences in growth rate or depth. Both nongrazed and moderately grazed Early Blackhull began to head 258 days after seeding—a few days before the other varieties. The nongrazed and moderately grazed treatments headed before the late overgrazed in each variety, indicating that late grazing retards production of heads. Early Blackhull produced the highest yield under all treatments except late heavy overgrazing, where it was exceeded by both the other varieties. Tenmarq and Turkey each produced its highest yield under the nongrazed and least under the late heavy grazed treatment. Early Blackhull yielded most under moderate and least under heavy grazing. The relatively heavy yields obtained were possibly influenced by optimum soil moisture, wide spacing of rows, and harvesting and threshing from small areas by hand.

Cache, a beardless, smut-resistant winter wheat, R. W. Woodward and D. C. Tingey. (Coop. U. S. D. A.). (*Utah Sta. Bul. 312 [1944], pp. 10*).—Cache (54a–40 or C. I. 11599), a beardless variety of winter wheat, was produced from a cross of Ridit × Utah Kanred made in 1927. It was distributed to farmers for trial in 1937. Yield data averaged for the entire testing period and all areas showed little difference between Relief, Utah Kanred, and Cache, but it has excelled Relief and Utah Kanred in resistance to the smuts found in this region. Cache is widely grown in the winter wheat areas of Utah and found to a limited extent in the Turkey Red wheat sections of other Western States. At present it is deemed the best variety available in a relatively pure state for the dry lands of northern Utah. Although few milling and baking tests are available for direct comparisons, millers in this area have accepted it without complaint.

Thorne wheat has spread rapidly in Ohio, C. A. Lamb, R. D. Lewis, and D. F. Beard (*Ohio Sta. Bimo. Bul. 227 (1944), pp. 92–94*).—Counts of red-chaffed, white-chaffed, and bearded wheats in Ohio in 1943 in fields in "reasonably representative areas" indicated that red-chaffed wheats (assumed to be practically all Thorne) occupied 67 percent of the fields.

"With probably 1,000,000 acres harvested in 1943 in Ohio and with very considerable acreages in other States, Thorne is now one of the most widely grown soft red wheat varieties in the United States. It reached this important position in 6 yr. from a start of 70 bu. of foundation seed planted in the fall of 1937."

Inspection of agricultural seeds, F. W. Quackenbush et al. (Coop. U. S. D. A.). (*Indiana Sta. Cir. 291 (1943), pp. 149, illus. 1*).—Continuing this inspection (E. S. R., 89, p. 308), the purity, germination, and weed seed contents, and for legumes the hard seed content, are tabulated from tests of 1,675 of the 1,929 official seed samples collected during the year ended June 30, 1943.

Montana seed law (as amended 1939), W. O. Whitcomb and A. H. Kruse (*Montana Sta. Cir. 176 (1943), pp. 16, illus. 2*).—This is a revision of Circular 155 (E. S. R., 82, p. 41).

Inspection of legume inoculants, F. W. Quackenbush, H. L. Mitchell, and A. S. Carter (*Indiana Sta. Cir. 294 (1943), pp. 4*).—This is the annual report (E. S. R., 89, p. 290) for 1943 on the effectiveness of legume inoculants and hormone preparations.

Effect of certain chemicals on the germination of crabgrass seed when plants are treated during the period of seed formation, J. A. DeFrance. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 331–335*).—Very substantial decrease in percentage of germination of crabgrass seed occurred when plants were treated at time of seed formation with sodium arsenite, sodium fluoride, sodium chlorate, a mixture of sodium arsenite and sodium chlorate, and four commercial preparations. If other cultural measures are neglected and crabgrass reaches maturity, the method reported should be of use. The materials at rates used also helped to control dandelion, plantain, cinquefoil, chickweed, hawkweed, heal-all, and sorrel.

The killing of weed seed in compost by the use of certain fertilizers and chemicals, J. A. DeFrance. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943). pp, 336–342*).—Comparatively high temperatures were obtained by mixing compost with organic N carriers. With N 15 lb. per cubic yard, one carrier developed 130° F. and another 105° in lots of about 1 cu. ft., and 160°–170° in lots of from 10 to 15 cu. yd. Satisfactory kill of weed seeds, however, was obtained by use of either organic or inorganic N carriers without generating such high temperatures, and smaller quantities of N were needed. Little or no temperature increase occurred with inorganic N, as cyanamide, and ammonium sulfate and limestone. Weed seed evidently may be killed in compost with cer-

tain fertilizers without generation of heat, which is not the only factor harming weed seeds. Established turf top-dressed with compost treated with these fertilizer materials received considerable benefit with no harmful effects.

HORTICULTURE

Production of carrots, J. H. and W. R. Beattie, R. E. Wester, and S. P. Doolittle (*U. S. Dept. Agr. Leaflet 125, rev. (1944), pp. 4, illus. 1*).—This revision (E. S. R., 77, p. 783) presents in like manner information as to climatic requirements, soils, fertilizers, culture, varieties, control of diseases, etc.

A mosaic-tolerant, pickling-type cucumber, J. D. and J. J. Wilson (*Ohio Sta. Bimo. Bul. 227 (1944), pp. 110–113, illus. 3*).—In 1939 a number of cucumber strains and hybrids were obtained as a basis for breeding a cucumber of the pickling type possessing tolerance to mosaic disease. From one of the cucumber stocks received, there was selected a new variety, Ohio 31, a homozygous segregate of the hybrid Tokio Long Green×National Pickle. When brined and processed, young fruits of Ohio 31 make excellent pickles. A comparison of Ohio 31 with National under conditions of severe aphid and mosaic infestations showed the Ohio 31 plants to survive until mid-September and to produce much more fruit than the National variety. The new Ohio 31 offers definite promise for replacing National in areas where mosaic is a limiting factor.

Experiments with the transplant onion crop in California, G. N. Davis and H. A. Jones. (Coop. U. S. D. A.). (*California Sta. Bul. 682 (1944), pp. 20, illus. 4*).—The transplant crop in California comprises about one-half the total onion acreage in the State and consists chiefly of the early varieties (Crystal Wax, Early Grano, Crystal Grano, and San Joaquin) and the intermediate varieties (Stockton Yellow Globe, Red 21, Stockton G36, and Italian Red). The results of spacing tests conducted over a period of 7 yr. showed that as the distance between plants in the row was increased beyond 2 or 3 in. there was an increase in the size of bulb and a decrease in acre yield. With the varieties used, the 3-in. spacing appeared best. At this distance the plants matured well, and there was no crowding in the row. The various spacings had no influence on the percentage of bolters in the 1935 season in which such records were taken. Early-planted sets produced larger bulbs and heavier yields per acre. Early transplanting of varieties that tend to bolt increased greatly the percentage of bolters. Based on 5-yr. trials at Davis, large transplants were significantly superior with respect to size of the resulting bulbs and in yields per acre. In the Babosa variety there was a gradual increase in the percentage of bolters as the size of transplants was increased from below ⅛ in. to ⅞ or 1 in. in diameter. Trimming of both the roots and tops of transplants caused a considerable reduction in yield. In 2 of 4 yr. the difference in yield between unpruned transplants and those with roots pruned, tops pruned, or both treatments were highly significant. In 2 yr. there was very little difference between the unpruned and those with either tops or roots pruned. Onions continued to increase in size and in yield per acre for some time after the tops break over.

Station breeding onions for resistance to insects, purple blotch, and pink root, A. M. Binkley and W. C. Sparks (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 2, pp. 8–11, illus. 2*).—A brief discussion is presented of the onion-breeding program conducted by the station and the U. S. Department of Agriculture. The immediate objective is to produce a thrips-resistant Mountain Danvers onion that carries the desirable characters of good bulb shape, type, color, and uniformity, with a capacity for dehydration and storage. In addition, there is needed a Sweet Spanish-type onion possessing greater resistance to purple blotch and pink root. Progress in the development of F_1 hybrid Sweet Spanish seed is discussed.

Gypsum (land plaster) for peas, C. B. Harston, V. G. Kaiser, and G. M. Horner. (Coop. U. S. D. A.). (*Washington Sta. V Cir. 17 (1944), pp. 3*).—Gypsum applied not later than April 20 at rates of from 100 to 250 lb. per acre to fields on 17 farms in Whitman County resulted in material increases in the yield of dry peas and of vines. There was considerable variation in the response on the different farms and even in different locations on single farms. Apparently on eroded hilltops the general fertility level was lower than on lower slopes, and here the gypsum did not produce as high percentage increases in yield. There was an indication of a greater response to gypsum on land which had been used for pea growing for some years than on new pea-producing areas.

Fertilizer and other experiments with pimientos, H. L. Cochran (*Georgia Sta. Bul. 231 (1943), pp. 20*).—The most economical yields of pimiento peppers were obtained when fertilizer supplying 48 lb. each of nitrogen, phosphoric acid, and potassium was applied per acre. The best results followed the splitting of the nitrogen application, using half with the other materials before planting and half shortly before July 1 as nitrate of soda or in some other available form. On some well-drained soils where good farming was practiced applications up to 800 lb. per acre proved profitable. No significant difference in yield of pimientos was noted whether the potassium was derived from muriate of potash, sulfate of potash, or kainit. The application of various quantities of magnesium sulfate proved of no benefit, with indications that if dolomitic limestone is used as a filler in the fertilizer the magnesium needs of the pimiento will be met. Boron, copper, zinc, manganese, and magnesium when applied in addition to the basic 600 lb. of fertilizer had no beneficial effects upon weight of fruit or thickness of the flesh. The use of 1 pt. of starter solution containing nitrogen, phosphorus, and potash materials around each plant at the time of setting is recommended. The value of the new station pimiento pepper, Truhart Perfection, is discussed. Early planting is desirable, with the plants set out on April 15 producing larger yields than those set later. The dates at which the plants may be set in the field in central Georgia without sacrificing yields too greatly range from April 15 to May 13.

Tomato production in Utah, L. H. Pollard, H. W. Peterson, H. L. Blood, and W. E. Peay. (Coop. U. S. D. A.). (*Utah Sta. Cir. 120 (1944), pp. 31+, illus. 16*).—This circular presents information on varieties, plant production, soils and their preparation, fertilizers, transplanting, irrigation, harvesting, standards, grades, diseases and insects and their control, etc.

Maturity and handling of green-wrap tomatoes in Mississippi, J. M. Lutz (*U. S. Dept. Agr. Cir. 695 (1944), pp. 12, illus. 2*).—Tomatoes harvested when immature ripened only 1 day earlier than comparable fruits allowed to remain on the vines until they had reached the mature-green stage. When attaining the ripe stage, tomatoes picked immature were inferior in quality and appearance and were also more subject to decay during ripening than the mature-green tomatoes. Cracking was not serious until the tomatoes has passed the mature-green stage. Ascorbic acid, specific gravity, total acidity, H-ion concentration, and size increased with advancing maturity, and resistance to puncture decreased. No relation between maturity and the content of soluble solids or sugars was noted. Decay development was closely associated with skin breaks. Shoulder bruising was reduced by using the smooth side of the shook on the inside of the field crate.

Pruning fruit trees in Kansas, R. J. Barnett and G. A. Filinger (*Kansas Sta. Cir. 218 (1944), pp 24, illus. 14*).—This revision of Circular 197 (E. S. R., 81, p. 515) presents in a like manner information on the principles and practices of pruning.

Apple guide for Kansas retailers, R. J. Barnett (*Kansas Sta. Cir. 219 (1944), pp. 24, illus. 5*).—Information is presented on types and varieties of apples, the

relation of color and size to sales appeal, factors underlying quality in apples, the importance of freedom from blemishes, the significance of firm flesh and toughness of skin in the handling of apples, apple grades, effective packaging, the storing of apples, and the importance of proper display, advertising, etc.

Sweet cherries, F. M. HARRINGTON and W. E. POLLINGER (*Montana Sta. War Cir. 7 (1944), pp.* [7]).—Information of a general nature is presented on varieties, pollination relationships, pruning, cultivation, fertilizers, relation of maturity of growth to winter injury, rodent injury, and harvesting and marketing.

New berries from Oregon's plant breeding research, G. F. WALDO, E. H. WIEGAND, and H. HARTMAN. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 416 (1943), pp. 12, illus. 4*).—Breeding studies with small fruits conducted since 1927 have included observations on about 120,000 strawberry, 11,000 blackberry, and over 6,000 red raspberry seedlings, all of known parentage. Of this great number, five new varieties have been named and introduced. These include the Corvallis and Brightmore strawberries, the Pacific and Cascade blackberries, and the Willamette red raspberry. These five varieties are described with respect to plant and fruit characters, adaptability for various uses, etc.

The strawberry in the home garden, H. E. THOMAS (*California Sta., 1944, pp. 8, illus. 4*).—Information of a general nature is given on varieties, soils, planting methods, spacing, cultivation, fertilization, control of diseases and insects, etc.

Propagation of the high-bush blueberry by softwood cuttings, W. L. DORAN and J. S. BAILEY (*Massachusetts Sta. Bul. 410 (1943), pp. 8, illus. 2*).—Hardwood cuttings of the highbush blueberry root very slowly. With this in mind, experiments were conducted with softwood cuttings of the Rubel variety taken on July 1, 8, and 15. Short side shoots, from 3 to 5 in. in length, with the basal cut at the base of the current season's growth were used. The rooting media were sand and a mixture of equal parts of sand and of sphagnum peat placed in glass-covered cases in a shaded greenhouse. The treatments with root-inducing chemicals were applied immediately before inserting the cuttings in the propagating frame.

In general, cuttings taken July 1 rooted more rapidly and responded better to treatments than did those taken at later dates. In fact, the untreated July 1 cuttings in sand-peat rooted 100 percent in 12 weeks. The effect of the chemical treatments on the July 1 cuttings was to hasten their rooting. In almost every case rooting was more rapid, root systems were superior, or total percentages larger in the sand-peat than in sand alone. However, the cuttings were usually more susceptible to chemical injury by the growth-producing substances in sand-peat than in sand. This tendency to injury was offset by the use of weaker concentrations on cuttings to be placed in the sand-peat. There was considerable difference between the various chemicals used with respect to injury to cuttings, and the time at which the cuttings were taken from the mother plants was a factor in their response to the various substances. Particularly in the case of the later cuttings, rooting was hastened sufficiently by the root-inducing substances to justify their use.

Gifts of the Americas: Kapok, C. H. BARBER (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 4 (1944), No. 3, p. 59*).—Kapok fiber procured from the seed pods of the kapok tree found in Latin America and in the Asiatic Tropics has proved very useful in the war period for filling life jackets, portable pontoons, and many other purposes, while the seeds and wood pulp are also of value. Ecuador and Brazil are the principal sources of kapok at the present time, and considerable progress has been made in planting in Central American countries. The tree grows to a height of 50 ft. or more, with the base sometimes occupying an area 20 ft. in diameter.

Pearl Harbor sent quinine home, W. C. Davis (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 4 (1944), No. 3, pp. 43–45, 50, illus. 4*).—Quinine is produced from the bark of the cinchona tree, a native of the Western Hemisphere. Prior to the present war, much of the cinchona bark was obtained from plantations in the East Indies. At present, supplies are coming from several of the South and Central American countries. This paper discusses the present situation with regard to cinchona production, methods of production, the value of improved strains, efforts being made to restore the industry, etc.

Top-working and bench-grafting walnut trees, L. W. Sherman and C. W. Ellenwood (*Ohio Sta. Spec. Cir. 69 (1944), pp. 15, illus. 23*).—Superior types of black walnuts are found in many localities in Ohio. Propagation of these selected trees is possible by grafting, either by top grafting of seedlings planted previously in permanent locations or by bench grafting on small seedlings during the winter months. This circular presents brief descriptions of the various technics of propagation and of the methods of handling the young grafted trees. The best results were obtained when the scions were used directly after taking them from the parental tree. However, if it is necessary to hold scion wood, the temperatures and humidities prevailing in refrigerated fruit storages are favorable for storing grafting wood. Scions should be made from wood of the previous season's growth. Protection of the young scion is necessary to prevent excessive drying before they become established on the stocks.

Trials of annual flowers, 1943, E. I. Wilde (*Pennsylvania Sta., Jour. Ser. Paper 1202 (1943), p. [26]*).—Herein are presented the results of a test conducted in 1943 of 254 samples of annual flowers representing 206 varieties.

Studies with the gladiolus in south Louisiana, W. D. Kimbrough (*Louisiana Sta. Bul. 372 (1944), pp. 11, illus. 1*).—New corms of Picardy gladiolus were obtained and planted each year from 1938 through 1942 in comparison with other corms saved currently from the growing crop. Many of the blooms produced from Louisiana-grown corms were good, but not as consistently good as were the plants from new corms. Corms stored at 40° F. gave better results than those held in common storage. *Fusarium* wilt appeared to be the most important factor in the deterioration of home stocks. The results favor the purchase of new corms each year or at least every 2 or 3 yr. As to the size of corm, the No. 1 grade produced significantly more blossoms than did smaller sizes and at the same time produced more No. 1 new corms for replanting. Early-planted corms produced consistently more flowers than did later plantings, and the young plants were able to withstand a moderate amount of frost. Although corms were produced successfully from cormels, the flowers from such corms were usually disappointing because of their small size. *Fusarium* wilt was often present in these home-grown corms. Where bloom stalks were removed before the blossoms opened, the yield of corms was increased. Information is presented on varieties and on diseases and insect control, and general recommendations are offered on culture.

Studies of pot-binding of greenhouse plants, A. T. Knight (*Michigan Sta. Tech. Bul. 191 (1944), pp. 51, illus. 25*).—Studies of factors underlying the development of a condition known as pot binding in potted plants failed to support the popular thought that the mass of roots at the surface of pots is due to more favorable aeration conditions. Moisture was observed to move readily through the soil at levels between the limits of saturation and moisture equivalent, resulting in a uniform air capacity in all parts of the soil on the same horizontal plane when the soil was uniformly packed in the pot. There was noted a direct relationship between the massing of roots on the periphery and root concentration within the soil mass. This was true in all the plants studied, namely, column stocks, primula, cineraria, coleus, and schizanthus. Pot binding

was found to be influenced by level of soil moisture and nutrition, with low soil moisture and nitrate deficiency being conducive to a greater massing of roots on the periphery at a certain stage of growth than occurred when these factors were favorable. A study of nutrient distribution in the soil failed to reveal any significant differences in concentrations of individual ions in different parts of the soil mass in the same horizontal plane, except where heavy leaching occurred, and likewise where no leaching occurred or pots were maintained fallow. The concentration of ions was affected by the manner of water application, whether from the surface or subirrigated.

Observing that plants of coleus, stocks, and geranium growing in an inverted position had a uniform distribution of roots, the author concludes that pot binding in the lower part of the pots in a normal upright position may be attributed to the tendency of roots to grow downward. There is an inherent tendency for roots of many kinds of plants to spread in a more or less definite pattern. In pots most of the roots upon reaching the walls do not reenter the soil, but tend to continue their development on the periphery. Pot binding as such cannot be considered to have a detrimental effect on plant growth. In fact, plants may be kept growing vigorously after reaching a pot-bound condition by supplying adequate nutrients and water. The maintenance of an adequate water supply becomes a problem when the tops need more water than the soil mass can provide in a given period.

FORESTRY

Forest terminology: A glossary of technical terms used in forestry, compiled and edited by R. C. Hawley et al. (*Washington 6, D. C.: Soc. Amer. Foresters, 1944, pp. 84+*).—This book was compiled and edited by the Committee on Forestry Terminology of the Society of American Foresters.

Germination tests on four species of sumac, I. L. Boyd (*Kans. Acad. Sci. Trans., 46 (1943), pp. 85–86*).—In view of the possibility that sumac seed would be needed in experimental plantings of domestic tannin plants, preliminary tests were made to determine a method—here outlined—of increasing the percentage of germination of *Rhus copallina*, *R. glabra*, *R. typhina*, and *R. aromatica*.

Reproductive habit of Douglas-fir, L. A. Isaac. (U. S. D. A.). (*Washington, D. C.: Charles Lathrop Pack Forestry Found., 1943, pp. 107, illus. 24*).—Due in part to uncontrolled fires, a large proportion of the Douglas fir lands of western Washington and Oregon cut-over in the last 20 yr. has failed to restock satisfactorily with trees. Mature Douglas fir trees produced about 1 lb. of seed each in good years, but much of this is destroyed by rodents, birds, and fires. Some seed does not fall on suitable soil. Individual seeds retain their viability not more than 1 yr. Seedlings are killed by surface temperature of 125° F. or more, and frosts, droughts, insects, diseases, and animals take a toll. Although some shade is beneficial, young Douglas fir seedlings cannot endure full overhead shade. Herbs and shrubs commonly found on cut-over lands compete seriously with the young trees. Grazing for a period of from 5 to 10 yr. on cut-over land not seeded to grass is not harmful to tree regeneration provided the grazing is light and managed carefully. The growth of Douglas fir trees is very slight in the first 3 to 4 yr., and even the dominant seedlings do not reach a height of 5 ft. until about 9 yr. of age on the average site. The mortality rate of seed trees left after logging is variable and high, especially where the slash is burned. Observations on some 539 trees on 10 acres showed 78 percent down or dead 11 to 15 yr. after logging. Natural restocking may be obtained by leaving seed trees after clear cutting; by leaving strips or blocks of trees; or, more rarely, from an abundant crop of seed already on the trees before cutting. Where 8 seed trees were left per acre, 4 or more may survive for 6 to 10 yr., the period

needed for reseeding. Under partial cutting plans there is an abundant seed supply, but care must be taken that the desired species are conserved. Control of overhead shade will largely govern the composition of the regeneration. With more than half overhead light or with complete openings of 1 acre or more, Douglas fir should dominate its more tolerant competitors. Burning tends to favor Douglas fir in competition with hemlock, cedar, spruce, and balsam, particularly after partial cutting. Controlled spot burning or partial piling and burning is practicable at times.

Forest planting in Ohio, R. R. Paton (*Ohio Sta. Bimo. Bul. 227 (1944), pp. 86–92, illus. 3*).—Information is given on the availability of forest nursery stocks, recommended species for planting, the need of careful planting, the control of grazing in forest plantings, etc.

A survey of forest plantations in Ohio, R. R. Paton, E. Secrest, and H. A. Ezri (*Ohio Sta. Bul. 647 (1944), pp. 77+, illus. 28*).—There are in Ohio, principally in the eastern section, some 1,500,000 to 2,000,000 acres of land which have little value for agricultural purposes and are producing little or no tree growth. Despite the fact that many areas have been abandoned or virtually so for many years, they have not returned to worth-while forests. Natural restocking has failed or is proceeding so slowly that artificial planting is indicated as the best solution. To gain the desired information as to how to best replant and manage the abandoned areas, a survey was made of existing plantations which had been established in Ohio during the past 37 yr. Such plantings were found for the most part on privately owned land and represented such a wide range in conditions as to afford an opportunity to study the factors underlying success or failure. Based on the results of the survey, conclusions and recommendations are presented with regard to the suitability of species for various sites, essential requirements for planting and culture, control of rodents and insects, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, [February 1 and February 15–March 1, 1944] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr., 28 (1944), No. 3, pp. 63–114, illus. 3; 4–5, pp. 115–170, illus. 2*).—The following are included:

No. 3.—Southern Cooperative Corn Disease Research Committee progress report for 1943, by J. H. McLaughlin; stem anthracnose and red rot of sorgo in Mississippi, by M. L. Lohman and I. E. Stokes; *Diaporthe sojae* on cowpeas, by L. Shanor and C. F. Taylor; evidence of boron deficiency observed on apples in New Jersey; *Penicillium gladioli* isolated from yam; the seasonal spread and development of cucurbit downy mildew in the Atlantic Coast States, by C. J. Nusbaum; nematode survey in Florida, by A. L. Taylor; tomato diseases in the east coast area of southern Florida; *Botrytis* stem girdling of tomato plants in Ohio; spinach downy mildew in a muck soil area of northern Florida; spinach diseases in the Winter Garden region of Texas; diseases of cabbage and broccoli in northern Florida; cabbage downy mildew in the Florida east coast region; downy mildew and other diseases on cabbage in Mississippi and Louisiana; diseases of cruciferous plants in the Winter Garden region of Texas; cauliflower diseases in central California; aster yellows and other carrot diseases in the Texas Winter Garden region, by H. W. Larsh; bean diseases on the east coast of southern Florida; beet and celery diseases (Calif., Tex); diseases of cucumber and squash in the east coast area of southern Florida; stem canker of eggplant in Florida; damping-off of lettuce in northern Florida; diseases of lettuce and endive in the Texas Winter Garden region; onion diseases in the Texas Winter

Garden region; pepper diseases in the Florida east coast area; diseases of salsify in central California; *Alternaria* tuber rot and other diseases on stored potatoes in North Dakota, by I. W. Tervet; potato storage (Mass., Ohio, Idaho) and field (Idaho) diseases; sweetpotato storage diseases in Texas, by G. M. Watkins; diseases reported on stored apples, carrots, onions, parsnips, squashes, and turnips in Massachusetts, by R. C. Cassell; fungus diseases of Florida forest trees (including lists of fungi and hosts), by W. A. Murrill; diseases of fruit trees in Missouri nurseries, by T. W. Bretz; and brief notes on root rot and leaf spot of Austrian winter peas in Mississippi, flax diseases in the Texas Winter Garden region, loss from wheat scab in northern Indiana, and strawberry leaf spot in Louisiana.

No. 4–5.—Phytophthora infestans late blight on eggplant in Florida, by A. L. Harrison and D. G. A. Kelbert; late blight on potato and tomato, and other diseases of solanaceous crops in the lower Rio Grande Valley of Texas, by S. M. Pady; diseases of solanaceous crops in southern Florida, by R. A. Hyre; tomato diseases in northern Florida, greenhouse tomato diseases in Indiana, and frost injury to tomatoes in the Imperial Valley of California; *Sclerotinia* and other diseases of lettuce and other winter vegetables in the Salt River Valley, Phoenix, Ariz., by W. G. Hoyman; reports on diseases of lettuce, endive, and escarole (N. C., Fla., La., Tex., Ohio, Ind., Calif.); reports on diseases of spinach (N. C., Fla., La., Tex., Calif.); reports on diseases of cruciferous crops (N. C., Ga., Fla., Ala., Miss., La., Tex., Oreg.); diseases of onions and related crops (Ga., La., Tex.); diseases of carrots reported from Texas; other reports on vegetable diseases in winter truck-growing areas, including bean diseases in Florida and Texas, celery diseases in Florida, parsley diseases in Texas, diseases of peas in Florida and Texas, and diseases of summer squash in Florida; nematode survey in Florida, by A. L. Taylor; vegetable storage diseases in New York (including much tabulated data), by L. J. Tyler; storage diseases of potatoes in Oregon, by L. W. Boyle; sweetpotato storage diseases in North Carolina, by R. E. Atkinson; other reports on storage diseases of vegetables, including storage decay of carrots in Oregon, seed potato inspection in Louisiana, potato ring rot in Ohio, and storage diseases of sweetpotatoes in Mississippi and Louisiana; status of tobacco black shank in North Carolina, by T. E. Smith; crown gall and irrigation water, by C. O. Smith and L. C. Cochran; further results with metal dialkyl dithiocarbamates for the control of the apple blotch fungus, by J. C. Dunegan; condition of the citrus groves in the Salt River Valley, Phoenix, Ariz., by W. G. Hoyman; survey to determine brown rot organisms on stone fruits in central California, by H. L. Barnett; other reports on diseases of fruit crops, including diamond canker on prune in central California, strawberry diseases in Mississippi, and leaf scorch on strawberry in Texas; reports on diseases of cereals, grasses, and forage crops, including condition of stored grain and soybean seed in Iowa, barley and corn diseases and *Sclerotinia* on flax in Texas, damping-off of flax in California, diseases of oats, *Pleospora* on lawn grass, alfalfa leaf spot, cowpea diseases in Texas, and *Ascochyta* on horse bean in California.

The more important diseases and insect pests of crops in Tennessee, C. D. Sherbakoff and W. W. Stanley (*Tennessee Sta. Bul. 186 (1943), pp. 142+, illus. 95*).—This copiously illustrated handbook presents brief descriptions of the more important diseases and insect pests of the main crop plants of Tennessee, exclusive of forest trees, with recommendations for their control. The crops are listed in alphabetical order. General sections deal with soil management as related to plant disease control, the care of plant beds, seed treatment, spraying and dusting, insecticides and fungicides in relation to health, biological control of insect pests, and spraying and dusting with plant hormones.

The antagonism of soil organisms to Fusarium oxysporum cubense, C. H. MEREDITH (*Phytopathology, 34 (1944), No. 4, pp. 426–429*).—Of the soil organisms, mostly actinomycetes, isolated from 66 soil samples in Jamaica, 122 proved antagonistic to *F. oxysporum cubense*—classified as 66 slightly so, 39 antagonistic, and 17 highly so. The antagonistic organisms were not evenly distributed in the soil samples, as 10 of the 66 had 44.2 percent of them. Actinomycetes antagonistic to this *Fusarium* in their own soil-solution agar were not always antagonistic when tested in other soil-solution agars.

Graminicolous species of Phyllachora in North America, C. R. ORTON. (W. Va. Expt. Sta.). (*Mycologia, 36 (1944), No. 1, pp. 18–53*).—In this monographic study, new taxonomy is involved in 15 of the 46 species of the genus studied. The highly parasitic nature of the species on grasses and of the genus as a whole has made it impossible thus far to cultivate any one of them on artificial media, which is one of the several difficulties found in studying this fungus group. The genus as a whole is characterized and its taxonomic status discussed. A key and index to the 46 species and an index to the genera and species of grass hosts are provided.

Toledíella nov. gên. da familia Phyllachoraceae, A. P. VIÉGAS (*Bragantia, 3 (1943), No. 6, pp. 123–129, illus. 12*).—*T. fusispora* n. gen. and sp., parasitizing leaves of members of the Myrtaceae, is described.

Über serologische Virusforschung und den diagnostischen Wert serologischer Methoden zum Nachweis der pflanzlichen, insbesondere der am Kartoffelabbaubeteiligten Viren [Serological investigation of viruses and the diagnostic value of serological methods for demonstrating plant viruses, particularly those of potatoes], C. STAPP (*Jour. Landw., 89 (1943), No. 3, pp. 161–188*).—This comprehensive review (90 references) considers the subject matter as regards the antigens, animal experiments, the antisera, preliminary treatment of antisera, determining their titer, differential serological methods (agglutination, precipitation, complement-fixation reaction, conglutination, the microprecipitin methods of Matsumoto and Hirane, Chester's field method, and the precipitin method of Dunjin and Popova with its modification by Jermoljev and Hruska), the development of serological virus research, adaptability of serological methods to virus demonstration, and the limits of these methods in detecting plant viruses.

Evaluation of foliage injury and water loss in connection with use of wax and oil emulsions, C. L. COMAR and C. G. BARR. (Mich. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 1, pp. 90–104, illus. 4*).—A controlled environment chamber is described, along with methods for evaluating the effects of wax and oil emulsions on plants as a function of environal conditions and emulsion formula. Infra-red photography proved useful in measuring and illustrating foliage injury involving chlorophyll destruction. Methods for determining efficiency and injury ratings are described, using sunflower as standard test plant. Data are presented illustrating how information can be obtained and used to determine and eliminate many of the problems and how to design experiments leading to the systematic formulation of satisfactory emulsions.

Treat seed grain, A. G. JOHNSON, R. W. LEUKEL, and R. J. HASKELL (*U. S. Dept. Agr., Misc. Pub. 219, rev. (1944), pp. 12, illus. 9*).—This informatory leaflet supersedes Miscellaneous Publication 330 (E. S. R., 80, p. 353).

Greenhouse method for testing dust seed treatments to control certain cereal smuts (*Phytopathology, 34 (1944), No. 4, pp. 401–404*).—The committee of the American Phytopathological Society on standardization of fungicidal tests here summarizes the principal causes of variability in the results obtained at times by different workers in cereal smut control with the same chemical dusts, and gives procedures worked out primarily for greenhouse testing of

commercial materials and promising new fungicides but not for use in developing new fungicides except as a final test in comparing them with standard materials. These procedures are presented in detail for *Tilletia tritici*, *Ustilago avenae*, *U. hordei*, and *U. nigra*. There are 21 references.

The potential importance of race 8 of Puccinia graminis avenae in the United States, E. C. STAKMAN and W. Q. LOEGERING. (Minn. Expt. Sta. coop. U. S. D. A.). (*Phytopathology, 34 (1944), No. 4, pp. 421–425, illus. 1*).—The primary object of this paper is to call attention to the increased prevalence of race 8 in 1943, which may be temporary or relatively permanent according to conditions affecting the various phases of rust development. Its increase in 1943 is important because it is evident that this race and race 10, which is combined with it for practical purposes, can cause heavy infection on Richland oats and on such varieties as Vicland, Boone, Tama, and others, mostly derived from Victoria × Richland crosses, and having the Richland type of resistance. Not only seedlings but also adult plants of these varieties proved susceptible, thus confirming the conclusions of Levine and Smith (E. S. R., 78, p. 797). As race 8 was isolated a number of times from large uredia on the hitherto geenrally resistant varieties and as there was abundant rust on them in some localities, there is no question of their susceptibility. The real issue is whether race 8 and the very closely related race 10 will increase, as certain races of *P. graminis tritici* have done in recent years. Races 8 and 10 have been rather widely distributed over the United States for several years, and the possibility of an increased prevalence must, therefore, be recognized. Although a further increase in those races might jeopardize the varieties deriving their resistance from Richland, there are no present indications of an increase in the United States of those races to which White Tartar and its resistant derivatives are susceptible. Moreover, there are indications from the work of Welsh (E. S. R., 77, p. 202) that it may be possible to obtain varieties combining resistance to all or most of the races now known.

Bibliography and nomenclature of Puccinia oryzae, W. W. DIEHL. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 4, pp. 441–442*).—This fungus, apparently a distinct race of *P. graminis*, is known only from limited areas in Spain and Italy. It has, however, such destructive potentialities that quarantine measures against it elsewhere are believed abundantly justified. The chief literature references are here commented upon, with the nomenclature used in each case given. Since *P. oryzae* has no technical description it is deemed a nomen nudum; the name considered valid is *P. graminis* P. f. *oryzae* Frag.

Fusarium diseases of broad bean.—I, A wilt of broad bean caused by Fusarium avenaceum var. fabae n. var., T. F. YU (*Phytopathology, 34 (1944), No. 4, pp. 385–393, illus. 1*).—The cause of this wilt is shown to be *F. avenaceum fabae* n. var., which is described. The disease occurs in the important bean-growing sections of Yunnan, China, where it causes considerable damage. The leaves of the diseased plants turn greenish yellow, then wither, and the plants eventually die; the vascular regions, especially the tap root and basal stem, are brown to dark brown.

Alguns fungos da mandioca, I, II [Some fungi from cassava, I, II], A. P. VIÉGAS (*Bragantia, 3 (1943), Nos. 1, pp. 19, illus. 7; 2, pp. 21–29, illus. 10*).—The author considers the following fungi pathogenic on cassava, viz, a mildew (*Oidium manihotis?*), *Sclerotium rolfsii*, *Phyllosticta manihobae* n. sp., *Exidiopsis manihoticola* n. sp., and *Fusarium aquaeductuum medium*.

Bacterial canker of cowpeas, D. E. HOFFMASTER. (Okla. Expt. Sta.). (*Phytopathology, 34 (1944), No. 4, pp. 439–441, illus. 1*).—The author reports a serious cankering of cowpea stems in Oklahoma during the 1942 season and the appearance of the disease the following year in several counties of the State,

as well as its probable presence in Texas. Bacterial colonies were yielded abundantly by the 1942 material, along with an occasional *Fusarium* colony; a survey of the literature gave no clue as to the nature of the trouble. According to unpublished work by E. W. Brilliant, the first authentic record of the disease in Oklahoma is that reported by him in 1931. He states that the causal organism, which he isolated from leaves, seed, and from fresh and overwintered cankers, is *Bacterium vignae*. In this note, some 29 cowpea varieties are listed according to their relative susceptibility-resistance performances as based on 100-ft. row counts of infected plants.

Xanthomonas vignicola sp. nov. pathogenic on cowpeas and beans, W. H. Burkholder. (Cornell Univ.). (*Phytopathology, 34 (1944), No. 4, pp. 430–432*).—The author describes *X. vignicola* n. sp., found responsible for cankers on cowpea stems and a blight of the common bean. It is similar to *X. phaseoli* but differs distinctly in pathogenicity and in certain cultural characteristics.

Grey mould (Botrytis cinerea) of flax, J. Colhoun (*Nature [London], 153 (1944), No. 3870, pp. 25–26*).—Since in some samples of seed examined over 25 percent were contaminated with *B. cinerea*, known to be the cause of gray mold of flax, inoculation tests on seed known to be free from infection were carried out with an isolate of the organism followed by typical infection in the subsequently developing seedlings. In seed treatment tests both in the greenhouse and outdoors very satisfactory control was obtained with either Nomersan or Ceresan U564.

Tests indicate treatment of pea seed is effective in control of root-rot diseases, J. L. Forsberg, E. Olson, and A. M. Binkley (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 2, pp. 5–7*).—The results of tests with New Improved Ceresan, Spergon, Arasan, and Yellow Cuprocide on pea seed of four canning and two pod-pea varieties were inconclusive as to the superiority of one treatment over another, but did indicate that in most cases any of the materials tried were better than no treatment at all. More of the factors influencing the effectiveness of seed treatments must be determined before complete recommendations can be made for any specific locality.

Reaktion einer Reihe von Solanaceen auf Infektion mit A-, Y- und X-Virus der Kartoffel unter Berücksichtigung ihrer Brauchbarkeit als Testpflanze [Reaction of a series of Solanaceae to infection with potato A, Y, and X viruses with reference to their serviceability as differential hosts], G. Stelzner and H. Schwalb (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 497–511, illus. 13*).—In order to ascertain their suitability as differential hosts for potato A virus, 68 solanaceous species were observed as to symptoms following inoculation by rubbing in of potato viruses A, Y, and X, the test being repeated in the spring, summer, and fall to determine the seasonal influences on symptom expression. Those species developing good symptoms were studied in detail. In all three tests, *Nicotiana alata*, *N. fragrans*, and *N. longiflora* showed positive and unmistakable infection with virus A; they also exhibited clear symptoms of attack by viruses Y and X.

Über den Wuchsstoffgehalt abbaukranker Kartoffelknollen [The growth substance content of virus-infected potato tubers], H. Söding, E. Köhler, and H. Funke (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 427–441, illus. 7*).—Single tubers from healthy stocks and from those with various degrees of infection were analyzed comparatively as to virus and growth substance contents. Badly diseased stock often possessed only 60 percent of the growth substance content of sound tubers; in such cases a diagnosis by the growth substance content of individual tubers was usually possible. In slightly diseased material the growth substance content was lowered to a lesser degree; diagnosis by single tubers was usually impossible in such instances, the average growth substance

content from a number of tubers being necessary. Leaf roll virus and apparently also the virulent mosaic viruses, at least in the later course of the disease, considerably reduced the growth substance content of the tubers; A and especially X viruses, on the other hand, appeared to act less vigorously in this respect. Potato varieties differed in their growth substance reactions to the individual viruses. The effects of the viruses on the growth substance content of the tubers paralleled their effects on the growth of the plant itself.

Charcoal rot of Irish potatoes, R. D. WATSON. (Tex. Expt. Sta.). (*Phytopathology, 34 (1944), No. 4, pp. 433–435, illus. 1*).—The author reports briefly on a rotting of potatoes known to be serious for a generation in eastern Texas. It appears to be due primarily to *Sclerotium bataticola*, and a serious decay of potatoes under irrigation in the Panhandle area was later attributed to the same fungus. All varieties grown in this region are apparently susceptible. The final stages of the rot are ordinarily associated with *Erwinia carotovora* or with *Fusarium* sp. Charcoal rot somewhat resembles late-blight tuber rot, but the two are said to be distinguishable to one familiar with the latter. High temperature seems the most important environal factor affecting its incidence and severity, but abundant moisture also favors its development. Control recommendations are based on present knowledge of the disease and its chief epidemiological factors.

Infection experiments with potato ring rot and the effect of soil temperature on the disease, A. F. SHERF. (Nebr. Expt. Sta.). (*Amer. Potato Jour., 21 (1944), No. 2, pp. 27–29*).—From this brief summary of greenhouse experiments (1941–42) it appears that the soil temperatures most favorable to potato (18°–22° C.) also favor the development of bacterial ring rot in stems, stolons, and tubers. At these temperatures about 25–30 days elapsed from first symptoms until death; high temperatures decreased infection, especially with seed-piece inoculations. No correlation was found between time of first leaf symptoms and distribution of bacteria in the plant at harvesttime. Bacteria were found in all vegetative parts of the plant, but more consistently in roots and underground stems. Infected plants without leaf symptoms or bacteria in aerial stems sometimes produced infected stolons and tubers; the reverse was also true, but in most infected plants there were both leaf symptoms and bacteria in the stem. Long stolons were less likely to produce infected tubers, but size of tuber was not correlated with percentage of tuber infection. The stem proved to be the most reliable part for obtaining smears for microscopic examination. Use of inoculum containing equal parts of cultures of *Erwinia carotovora* and *Phytomonas sepedonica* decreased the percentage of infection and increased the incubation period as compared to use of the ring rot organism alone but resulted in a greater percentage of tuber infection with visible rot at the stem end. The ultraviolet light equipment of Iverson and Kelly (E. S. R., 85, p. 211) failed to show some infected tubers that were detected by culturing or staining. Roccal (1–100) proved effective against the organism on contaminated metal surfaces. The bacteria remained viable for long periods (at least 28 mo.) on agar culture slants covered with mineral oil.

Certified seed potato conference (*Amer. Potato Jour., 21 (1944), No. 2, pp. 52–54*).—A brief report of the annual meeting of the International Crop Improvement Association (November 30–December 2, 1943) regarding the 1943 seed potato inspection problems and the 1943–44 seed potato storage situation.

Disease control on potatoes and sugar beets, J. H. MUNCIE. [Mich. State Col.]. (*Mich. Muck Farmers' Assoc. Proc., 25 (1943), pp. 17–18*).—A brief discussion of disease control problems for potatoes and sugar beets on muck soils.

Diseases of sugar beets in crop rotations at the Huntley Branch Station, Huntley, Montana, from 1936 to 1941, M. M. AFANASIEV and H. E. MORRIS

(*Montana Sta. Bul. 419 (1943), pp. 23, illus. 3*).—In the 20 rotations investigated since 1912 or 1916, seedling diseases of sugar beets (1936–41) were high in all unmanured rotations except in 2 which had somewhat different soil from the rest; plants grown in manured rotations had relatively small amounts of disease. Sugar beets grown in unmanured rotations which had several years of alfalfa exhibited a considerable amount of P deficiency, whereas similar rotations plus manure were practically free of this trouble. Sugar beet yellows was present in the 1-, 2-, and 3-yr. rotations and practically absent in the 4- and 6-yr. rotations. Beets grown in 1-, 2-, and 3-yr. rotations without manure always showed signs of N deficiency by midsummer. In general, the stands and yields of sugar beets were fairly good to excellent in manured rotations, poor in the unmanured, and very poor in unmanured rotations with alfalfa. The top-to-root ratios of the beets grown in these rotations were about normal except in certain ones where the tops were considerably heavier than the roots, with indications that the available P was more depleted than N in these soils; this was especially true in unmanured rotations with alfalfa. The occurrence of large amounts of seedling disease and a considerable amount of P deficiency, mainly in the unmanured rotations, indicates that soil depletion was largely responsible for the prevalence of this condition. Beets planted in the maximum crop-production rotation, the soil of which was well supplied with manure and inorganic fertilizers, had a minimum of diseases and excellent yields and stands.

Treatment of segmented sugar-beet seed greatly reduces damping-off of seedlings, J. O. Gaskill and W. A. Kreutzer. (U. S. D. A.). (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 2, pp. 12–13*).—With heavy seedings of whole seed preemergence damping-off may go largely unnoticed, but when segmented seed and very low seeding rates are employed to make the use of mechanical thinning methods possible serious lowering of stands from this cause may be experienced. Two replicated seed-treatment tests (1943) in two localities, using four dust fungicides (Arasan, Spergon, New Improved Ceresan, and Yellow Cuprocide), gave seedling stands that were significantly greater than those obtained from untreated seed and the average improvement for the last two fungicides amounted to at least 105 percent. Since sugar companies often distribute treated seed and additional treatment might be detrimental, growers are advised to determine this point before themselves applying any fungicides.

Prevalence and distribution of stripe smut of Poa pratensis in some pastures of Pennsylvania, K. W. Kreitlow and W. M. Myers. (U. S. D. A. et al.). (*Phytopathology, 34 (1944), No. 4, pp. 411–415*).—Examination of *P. pratensis* plants in sod plugs collected from different parts of each of 13 representative pastures in Pennsylvania revealed that *Ustilago striaeformis* infection was present at the time of sampling to the extent of 0.5–11.4 percent. When the sod plugs from each pasture were maintained separately and observed periodically, there was in most cases an increase in number of plugs containing smutted plants—attributed to expression of symptoms among those that were symptomless at time of collection and to dormant infection. The total number of plugs recorded as containing smutted plants during 5 months' observation varied for different pastures from 4.5 to 34.4 percent. Observations on the distribution of stripe smut in different parts of pastures revealed that some contained a fairly uniform infection over the entire area; others, variable amounts for different areas.

Control of bacterial wilt (Bacterium solanacearum) of tobacco as influenced by crop rotation and chemical treatment of the soil, T. E. Smith. (Coop. N. C. Expt. Sta. et al.). (*U. S. Dept. Agr. Cir. 692 (1944), pp. 16, illus. 5*).—This wilt, one of the most destructive diseases of tobacco, not only reduces yields but also results in wasted time and labor of the growers. Preliminary

work, begun in 1935, is now completed on the development of resistant strains and on urea treatment of soils; they are the most promising control measures now in sight, though not made available for commercial use. These studies have also provided information on crop rotations—the method now in use—of immediate value to producers who must still depend on this practice for wilt control during the next few years. Wilt was not eliminated from the soil by 1–4 yr. of bare fallow, but considerable variation in control was obtained by rotations with different immune crops. Elimination of susceptible weeds failed to influence the effectiveness of rotations. Results indicated that control by rotation does not depend entirely on the resistance of the plants grown, and soybeans, previously considered susceptible, can be used safely in rotation on wilt-infested land. Under the exceptionally severe wilt conditions of 1939, rotations of corn, soybeans, and redtop proved more effective than those of sweetpotato, crabgrass, or native weeds. In 1939 a rotation of 3 yr. between tobacco crops was more effective than 1–2 yr., but the latter gave satisfactory control when the disease was less severe. Increased wilt control was obtained with slightly resistant tobacco strains on land rotated to corn for 1 yr., though but little betterment followed where moderately or highly resistant strains were grown on rotated land. Urea treatment of the soil at the rate of 400 lb. N per acre gave effective control, and tobacco grown on treated soil in rotation with 1 yr. of corn produced a normal crop of high-quality leaf. Chloropicrin also proved satisfactory, but the cost and inconvenience of application precludes its large-scale use. Soil treatment with a large number of complex organic chemicals and several modifications of culture practice failed to lessen wilt severity. Crop rotation, heretofore only moderately effective, must continue to be used. Improved rotation practices are now developed, but even so this method will not be found consistently effective. To obtain the best results tobacco should be grown after at least 3 yr. of corn, soybeans, or redtop.

Studies on vegetable seed treatments in 1943 (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr., 1944, Sup. 145, pp. 97+, illus. 2*).—Series of uniform seed-treatment tests were made with 13 vegetable crops during 1943, using a total of 233 sets of seed distributed to 60 cooperators in 34 States and in 2 Canadian Provinces. Each set consisted of 5 replications of 100 seeds each from various treated lots prepared by the crop leaders. The reports offer considerable data on the severity of seed decay and damping-off in different localities, the value of different fungicides, and the minimum effective dosages that can be employed under different environal conditions. Considerable emphasis was placed on the rate of application because the use of different dosages is a preferred method of evaluating fungicides. Furthermore, the information obtained should prove of great service in making effective use of existing supplies of fungicides. The following reports are included: Scope of the 1943 tests, pea seed treatments, and pretreatment of uniform seed before distribution to growers, by G. L. McNew; sweet corn seed treatments, by C. M. Haenseler; lima bean and snap bean seed treatments, by J. C. Walker and W. W. Hare; soybean seed treatments, by R. H. Porter; cooperation of seedsmen in treating seed before distribution, by W. Crosier and R. H. Porter; spinach seed treatments, by R. P. Porter; beet seed treatments, by L. D. Leach; tomato and cucumber seed treatments, by S. P. Doolittle; onion seed treatments, by A. G. Newhall; potato seed disinfectants, by C. N. Clayton; sweetpotato seed treatments, by C. J. Nusbaum; corn seed treatment tests for Central and Northern States region, by G. Semeniuk; and 1943 results of uniform seed-treatment tests on soybeans, by B. Koehler.

This series of papers constitutes the 1943 report of the vegetable seed treatment subcommittee of the seed treatment committee to the American Phytopathological

Society. The papers of Koehler and Semeniuk report work done independently of the vegetable committee.

Control of vegetable diseases in home gardens, J. A. Pinckard (*Mississippi Sta. Cir. 114 (1944), pp. 11, illus. 7*).—General sections of this practical circular concern the control of root knot, stem rots and wilts, and root rots; spraying and dusting; and directions for making bordeaux. Data are also included on control for specific crops (lima and snap beans, cabbage, cucumbers and melons, potatoes, and tomatoes.

Guttation-salt injury on leaves of cantaloupe, pepper, and onion, S. S. Ivanoff. (Tex. Expt. Sta.). (*Phytopathology, 34 (1944), No. 4, pp. 436–437, illus. 1*).—A note on such injury occurring on these plants in nature and reproduced under more or less controlled conditions. Since guttation seems to be a common phenomenon, it is believed possible that other plants may be subject to this same kind of injury. It is suggested that perhaps the nonparasitic tipburn of lettuce, potato, and other plants should be reexamined from this standpoint.

Carrot bacterial blight as it affects the roots, P. A. Ark and M. W. Gardner. (Univ. Calif.). (*Phytopathology, 34 (1944), No. 4, pp. 416–420, illus. 2*).—Black, scabby lesions on carrot roots were found due to *Phytomonas carotae;* deep constrictions and internal pockets of necrotic tissue may result from early infection. The organism is harbored in the soil and the disease becomes serious in fields cropped repeatedly to carrots. Hot-water treatment of the seed proved effective against seed-borne infection.

The control of celery blights with bordeaux, the fixed coppers with and without sulfur, and fermate, J. D. Wilson (*Ohio Sta. Bimo. Bul. 227 (1944), pp. 95–109*).—Blights of celery— both early (*Cercospora apii*) and late (*Septoria apii*)—occur annually in Ohio, the former being more common but less likely to cause severe losses; control is difficult under weather conditions favoring either fungus. The spray and dust formulas and procedures for control were worked out by Wilson and Newhall in 1930 (E. S. R., 64, p. 350); since then the fixed coppers and various organic compounds have been tested over the years, with bordeaux included as a standard in most of the experiments where it has consistently ranked at or near the top in blight control and yield increases. The summarized results of six fixed-copper compounds in 12 tests over 7 yr. indicated Copper A to rank best in four of every five yield comparisons, followed by COC–S, Cuprocide, Copper Hydro 40, Tribasic, and Cupro–K in decreasing order for both yields and blight control. Spraying with fixed coppers and bordeaux reduced the yields somewhat in the absence of disease, the latter being more injurious in one test. Dusting and spraying were of comparable effectiveness in blight control. When fixed coppers were subjected to about 335° F. and then applied under a steam pressure of 100 lb. with a steam sprayer, the disease control was similar to that with the usual hydraulic pressure applicators; bordeaux was altered unfavorably by these conditions but was less affected and gave better control at 75 lb. and 300°. Addition of spreaders, adhesives, or lime to fixed coppers did not appear justified. Reducing an 8–8–100 bordeaux formula to 8–4–100 made little difference in disease control or yield in the one test tried, but may be justified where further addition of lime to the soil is undesirable. Spray applications every 6 days struck a favorable balance between the injury at 4-day and the poor control at 8-day intervals. Sulfur alone failed to control blights or increase yields but was satisfactory when added to spray and dust formulas containing fixed copper. In single comparisons, adding Cal Zinc to COC–S or use of rotenone did not appear justified. COC–S dusts prepared with various diluents varied but little in control. Fermate gave good results in three tests on muck soil, but there was some evidence of host injury. As a result of these experiments, at least three formulas may be

recommended for the State, viz, bordeaux 8–8–100, a mixture of any one of several fixed coppers with sulfur (4–8–100 as a spray or 14–20–66 with talc as a dust), and Fermate (3–100 as a spray or 10–90 with talc as a dust). Spray or dust applications should be made every 6 days from about 2 weeks after planting until just before blanching. Sprays should be given at about 150 gal. and dusts at 40 lb. per acre. Use of adhesives or wetting agents is optional.

Present status of wilt-resistant hybrid mints and plans for their further development, R. Nelson. [Mich. State Col.]. (*Mich. Muck Farmers' Assoc. Proc., 25 (1943), pp. 38, 40*).—A progress report. Pending the decisions of the commercial users of oils, the plantings of the two most promising *Verticillium*-wilt-resistant hybrids are being extended and the breeding work is being continued.

Control of the truffle in beds of the cultivated mushroom, A. M. Kligman (*Phytopathology, 34 (1944), No. 4, pp. 376–384, illus. 1*).—Truffle spores were regularly germinated and ascocarps obtained by inoculating bottles of pure-culture manure spawn and incubating at 72°–85° F. The factors influencing spore germination and growth are described. Since these spores fail to germinate at 60°, a positive control method is afforded through the regulation of temperature. Additional evidence is cited to show that the soil is the source of spores. Since secondary infection does not occur, use of fungicides is unjustified. When invasion of the bed is only superficial, production may be restored by drying up the infested area, followed by watering as usual. A number of fungicides tested were ineffective against truffle spores after 6 hours' exposure.

Seed transmission of squash-mosaic virus, J. T. Middleton. (Calif. Citrus Expt. Sta.). (*Phytopathology, 34 (1944), No. 4, pp. 405–410, illus. 2*).—The symptoms of this disease are described and the virus is shown to be seed-transmitted. Light, poorly filled, deformed seed proved to carry a higher percentage of the virus than good-quality, heavy, well-filled seed taken from the same seed population. The virus remained viable in 3-year-old seed, and there was no apparent difference in the amount of transmission in seed samples sown shortly after harvesting or about 3 yr. later. The disease may be controlled to some extent by harvesting seed from fields free of the disease and perhaps also by planting in areas not in close proximity to vector-breeding grounds. If seed is taken from fields known to be infected, the amount of seed transmission may be materially reduced by careful winnowing.

Studies on bacterial canker of tomato, P. A. Ark. (Univ. Calif.). (*Phytopathology, 34 (1944), No. 4, pp. 394–400*).—Comparisons of the white, pink, and rough variants of *Phytomonas michiganensis* with the normal strain showed them to differ slightly in their reactions on media and to be less pathogenic. *Nicotiana glutinosa* and *Cyphomandra betacea* were successfully infected. *Myzus persicae, Lygus pratensis, Thrips tabaci, Heliothrips fasciatus,* and *Diabrotica duodecimpunctata* failed to transmit the disease under greenhouse conditions, nor could *P. michiganensis* be recovered from their mouth parts or internal organs after feeding on diseased plants. More infections were obtained when the plants were topped with a contaminated knife than when punctured with a contaminated needle; the knife cuts remained susceptible to invasion for 72 hr. Unwounded plants failed to develop infection when sprayed with a heavy bacterial suspension and incubated in a moist chamber. Brilliant and malachite green dyes proved effective in killing the pathogen in aqueous and alcoholic solutions. Soaking tomato seeds for more than 60 min. in 5 and 30 percent alcoholic solutions of brilliant green, malachite green, and rosaniline hydrochloride, as well as in water solutions of these dyes, was not injurious, nor did dry heat injure seeds exposed to temperatures high enough to kill the pathogen.

Dry seeds withstood air temperatures up to 85° C. for 15 hr.; this, however, reduced germination.

Blister spot, a bacterial disease of apple, M. A. Smith. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *68* (*1944*), *No. 7, pp. 269–298, illus. 6*).—The blister spot disease of apples, first described from Missouri in 1916 and attributed to *Pseudomonas* (*Phytomonas*) *papulans*, has been reported only in the United States (Mo., Ark., Ind., Pa., Va., and Ill.) and has been found spontaneous only on apple fruits. Lesions on fruits appear as blister spots surrounded by water-soaked areas and may extend 0.02 to 0.04 mm. below the cuticle. Immediately beneath the diseased area a phellogen layer 3–5 cells in thickness develops. The bacteria are present intercellularly throughout the region of the papules. In later stages the epidermis over the blister spot becomes black, dies, and breaks loose from surrounding healthy tissue. The pathogenicity of the organism to wounded and nonwounded immature apple fruits was demonstrated. The incubation period for fruit inoculations averaged 21 days. Wound inoculations of immature fruits of apple, plum, cherry, and of tomato fruits in moist chambers were successful, as were also wound inoculations of twigs of apple, cherry, pear, plum, and lilac and leaves of apple, peach, magnolia, and lilac. Needle puncture inoculations of fruit and twigs of apple with the lilac blight organism (*Phytomonas syringae*) were successful. An isolate from an undescribed leaf spot disease of magnolia proved pathogenic to apple fruit and twigs and to lilac and magnolia foliage. Two isolates from target canker of apples were not pathogenic to fruit and twigs of apple. An isolate from an undescribed leaf spot on Rome Beauty apple failed to infect apple leaves, twigs, or fruits. The blister spot organism remained viable on fruits kept outdoors from October 16 to March 15, after which the fruit tissue had largely disintegrated and reisolations were unsuccessful. Studies were made of the morphology and physiology of 18 isolates of the blister spot organism, 3 of *P. syringae*, 2 from apple target canker, 1 from an undescribed leaf spot of magnolia, and 1 from an undescribed leaf spot on Rome Beauty apple foliage. The blister spot, *P. syringae*, and magnolia leaf spot isolates bore close morphological resemblances; the target canker and Rome Beauty apple leaf spot isolates appeared unrelated. A study of the cultural characteristics and physiology of the various isolates indicated the blister spot, *P. syringae*, and magnolia isolates to be very closely related; the target canker and Rome Beauty apple leaf isolates are regarded as unrelated species. It is concluded that the blister spot organism, because of its morphological, cultural, physiological, and pathogenic similarity to *P. syringae* should not retain specific rank. On the other hand, it exhibits enough cultural, physiological, and pathological differences to justify separation from typical *P. syringae*. Because of these differences, the blister spot organism is described as *P. syringae papulans* n. var.

Sporonema rot of apples, L. P. McColloch. (U. S. D. A.). (*Phytopathology, 34* (*1944*), *No. 4, pp. 437–439, illus. 1*).—Report of a case of rot in a York Imperial apple stored at 36° F. in the same room with cranberries, caused by a fungus identified as *S. oxycocci*. In the course of other studies on the sources of certain fungi causing decay of stored apples, a species of *Sporonema* was isolated and again found to cause decay when inoculated into apples. Observations on this fungus and descriptions are given briefly.

Statistical studies of distribution of psorosis-affected trees in citrus orchards, A. A. Bitancourt and H. S. Fawcett. (Calif. Citrus Expt. Sta. et al.). (*Phytopathology, 34* (*1944*), *No. 4, pp. 358–375, illus. 4*).—On the maps of 14 sweet orange orchards in California, on which psorosis trees (3.8–70.6 percent) had been recorded, counts of diseased trees around diseased v. healthy

trees were made. These were made separately, first for the 4 trees closest to the diseased or healthy central trees (distance L) in all 14 orchards, and then, successively, for the 4 trees at distances 1.4 L, 2 L, and 2.8 L from central trees in 11 of the orchards. In 13 orchards there were greater numbers of diseased trees at distance L from diseased trees than at the same distance from healthy trees, and the differences were significant or highly significant statistically in 11. For these 11 orchards, differences in favor of diseased trees were found in 10, 10, and 9 orchards, at distances 1.4 L, 2 L, and 2.8 L, respectively, the differences being significant or highly significant in 7, 6, and 2 of the orchards for the respective distances. A marked decrease of the difference was observed as the distance from the central tree increased, the mean for all the differences available being 0.305 ± 0.022 for distance L, 0.262 ± 0.025 for distance 1.4 L, 0.233 ± 0.027 for distance 2 L, and 0.119 ± 0.027 for distance 2.8 L. A separate analysis for the 2 trees at distance L from diseased trees and from healthy trees, along rows and along arrays, showed that in only 2 orchards were there significant differences in the mean number of diseased trees at distance L from diseased trees along rows and along arrays. This difference is interpreted as indicating that in those 2 orchards runs of diseased trees from the same bud stick from diseased parent trees had been set along rows at the time the orchards were planted.

Comparison with maps of fictitious orchards, on which given percentages of diseased trees were randomly distributed at given distances from randomly distributed diseased trees, showed that the differences found for the actual orchards were in some orchards comparable to those that would occur if 2.2–17 percent of the diseased trees in the orchard had become diseased as a result of transmission from diseased trees at distance L, with correspondingly decreasing percentages as the distance increased. Among the possible causes of transmission, root grafts occurring naturally in the orchard are considered as most likely to result in (1) the high percentage of transmission that would produce differences as great as those observed and in (2) the comparatively rapid decrease in the differences as the distance from a central tree increases. The possibility of additional means of transmission, as by insect vectors, cannot be entirely dismissed.

Brown rot and other fungal wastage in harvested peaches, R. S. Willison (*Sci. Agr., 24 (1944), No. 5, pp. 221–233, illus. 6*).—Over 5 yr. (1938–42), a 4-spray schedule comprising treatments early in blossom time, at shuck fall, 2–3 weeks before harvest, and just before picking reduced brown rot incidence during the first week after harvest by 40–65 percent in the worst years and by 65–100 percent in other years. Various fungicides were used. In view of the possibility of a rapid build-up of inoculum at any time, omission of any of the sprays in the regular schedule would be likely to reduce the efficiency of the program. Wrapping peaches in tissue tended to add to the effectiveness of spraying by reductions of chance contamination in the pack. Infection occurred at temperatures as low as 33° F., but the incubation period was greatly prolonged so that for practical purposes prompt refrigeration at or below 45° proved satisfactory. In long-distance shipping where transportation exceeds 1 week 33° is recommended; for shorter hauls 45° suffices. The rate of incidence of brown rot during the first few days after removal to room temperature is lowered as the holding temperature in cold storage approaches 32° but tends to rise as the time in cold storage lengthens. Rot due to *Rhizopus nigricans* was not observed on peaches during refrigeration, but may be serious after storage. It seldom appeared on peaches at room temperature until the second week after harvest unless the pack was damp. This mold tends to spread from fruit to

fruit to form "nests" of rot to a greater degree than does brown rot. *Rhizopus* rot does not appear amenable to spraying.

Brown rot and gummosis infections causing serious losses, L. J. Klotz (*Calif. Citrog., 29 (1944), No. 5, p. 116, illus. 2*).—These two troubles are reported as having caused unusual damage in California citrus orchards since the 1938 season. Control methods based on field and laboratory investigations are briefly summarized.

Further investigations on the war-time control of walnut blight and filbert blight, P. W. Miller. (U. S. D. A. and Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 35 (1943), pp. 103–106*).—Extensive experimental results over 13 yr. (E. S. R., 89, p. 233) have indicated conclusively that bacterial blight of Persian walnuts can be controlled by timely applications of bordeaux, but in view of possible shortages of Cu tests were carried out (1943) with Fermate and Thiosan (both at 1–100). Under the experimental conditions these fungicides were of little if any value for control, but a reduction in the bordeaux formula from 6–2–100 to 4–2–100 indicated the latter to give practically as good results in this average season as the higher Cu fungicide. Similar results were obtained in reducing yellow cuprous oxide from 1.5 to 1 lb. per 100 gal. of water. Furthermore, certain fixed Cu materials (zinc-copper ammonium silicate, 20 percent copper oxalate, and tribasic copper sulfate) gave comparatively good control in 1943. Current work on filbert bacterial blight also confirmed the results of past studies in showing that timely spraying with bordeaux will materially reduce the incidence of bud and twig infection. Addition of lead arsenate with a spreader also controlled the filbert worm, and reduction of the bordeaux formula from 8–4–100 to 6–3–100 gave practically as good results against the blight.

Preliminary report on the use of boron on walnut trees (Juglans regia L.), C. E. Schuster and R. E. Stephenson. (U. S. D. A. and Oreg. State Col.). (*Oreg. State Hort. Soc. Ann. Rpt., 35 (1943), pp. 133–137*).—The results of this preliminary work do not as yet justify definite conclusions, but "snakehead" and dieback appear to be associated with boron deficiency and leaf scorch and leaf roll may also be associated with this condition. The fruit set and nut yield may depend in part on the correction of B deficiency. About the upper limit for safe soil application to walnut trees 15–20 yr. old on soils of rather heavy texture was 7–10 lb. per tree. Soil application is believed more satisfactory than the insertion or spray methods of treatment. Except where insertions of boric acid are made, 2–4 yr. may elapse before a response is evident; insertions may give a response by fall after a spring treatment. This method causes large wounds which may not be healed over even by the end of the second year afterward.

Über zwei in der Schweiz bisher wenig bekannte Schüttepilze der Kiefern: Hypodermella sulcigena (Rostr.) v. Tub. und Hypodermella conjuncta Darker [On two hitherto little known needle-cast fungi of pines in Switzerland: H. sulcigena and H. conjuncta], C.-A. Terrier (*Phytopathol. Ztschr., 14 (1943), No. 5, pp. 442–449*).—The pathogens are described, and such matters as the symptoms, damage caused, susceptibility, geographical distribution, and control are discussed.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Facts on pheasants appear from arboretum study (*Wisconsin Sta. Bul. 461 (1943), pp. 13–15, illus. 2*).—Facts concerning pheasants, previously unknown but highly useful to wildlife management, are reported upon briefly from studies on the population in the 1,000-acre arboretum of the University of Wisconsin.

The 1943 Christmas bird census in Iowa (*Iowa Bird Life, 14 (1944), No. 1, pp. 8–10*).—Discussion and tabulation for 13 Iowa localities and 62 bird species.

Food habits and management of American sea brant, C. Cottam, J. J. Lynch, and A. L. Nelson (*Jour. Wildlife Mangt., 8 (1944), No. 1, pp. 36–56, illus. 9*).—The sea brant or brant goose, a littoral and pelagic game bird of superior quality, is said to be specialized and under more restrictions as to requirements of environment and food than any other common aquatic game species, on wintering grounds being confined mainly to shallow bays and estuaries with eelgrass; it has been sharply reduced in numbers since 1931. This contribution considers its distribution (with maps), populations on the east and west coasts of the United States, longevity, migration, flight, weights, food, feeding habits and grounds, nests, nesting grounds and behavior, management problems, and brant shooting. The sea brants are held by the authors to be races of the one species *Branta bernicla.* There are 37 references.

Natrix as a predator of fish in the Dallas area, P. Fontaine (*Field and Lab., 12 (1944), No. 1, pp. 17–18, illus. 1*).—This common nonpoisonous water snake is reported capable of swallowing fish of considerable size, and several observed cases are noted, with a photograph of one taken in the act.

The coregonine fishes of northwestern Canada, J. R. Dymond (*Roy. Canad. Inst., Trans., 24 (1943), pt. 2, pp. 171–232, illus. 3*).—This monographic study of species of *Coregonus, Prosopium, Leucichthys,* and *Stenodus* deals mainly with their characteristics, nomenclature, distribution, and relationships, but includes some information on their ecology, life history, habits, and economic value.

Phenomenal growth rates of black bass in Louisiana waters, P. Viosca, Jr. (*La. Acad. Sci. Proc., 7 (1943), p. 75*).—An abstract.

Survival of hatchery-reared brown and rainbow trout as affected by wild trout populations, P. R. Needham and D. W. Slater (*Jour. Wildlife Mangt., 8 (1944), No. 1, pp. 22–36, illus. 3*).—The survival of 63 experimental plantings of fingerlings of these two fish under controlled conditions is reported for five seasons (1939–42) at Convict Creek, Calif. A method described and used for analyzing the effects of competition by wild trout on survival of planted fish embodied a food ratio shown to correlate with observed survivals. A gross survival of 63.7 percent was obtained for brown trout fingerlings 1.25–1.56 in. in total length. Larger rainbow fingerlings (2.88–3.72 in.) under more severe competition had a gross survival of 46.6 percent; other rainbows (1.32–1.69 in.) gave a gross survival of 44.2 percent. These results were obtained in experimental periods of 89–151 days. Plantings of fingerlings are largely ineffectual in streams containing numerous wild trout, since competition and predation prevent any significant survival. Natural propagation adds large numbers of fish to stream stocks annually. Heavy overwintering loss of naturally propagated brown trout in their first year was clearly indicated. The bearing of these findings on the stocking of streams is discussed.

Development of eye flukes of fishes in the lenses of frogs, turtles, birds, and mammals, M. S. Ferguson (*Jour. Parasitol., 29 (1943), No. 2, pp. 136–142; also in Rockefeller Inst. Med. Res. Studies, 124 (1943), pp. 407–415*).—Cercariae of the strigeid trematode *Diplostomum flexicaudum* and other cercariae probably of the same species penetrated and grew into metacercariae in the lenses of tadpoles, frogs, turtles, chicks, ducklings, mice, rats, guinea pigs, and rabbits; they were normal in appearance and behavior and similar to those developing in the eyes of fishes, the normal intermediate hosts. Furthermore, metacercariae from the lenses of a frog and a guinea pig were infective for chicks, and normal adult worms with eggs were recovered from the bird intestine after a week. Blindness

was caused in many of the infected eyes. The possibility that these eye flukes may cause disease in man is considered rather remote.

The rhaphidophorid Tachycines asynamorus Adelung in America (Orthoptera: Gryllacrididae: Rhaphidophorinae), J. A. G. Rehn (*Ent. News, 55 (1944), No. 2, pp. 36–39*).—Comparisons of authentic specimens of the greenhouse stone cricket with those in collections at the Academy of Natural Sciences of Philadelphia indicate the species to have been found in New York, Pennsylvania, Ohio, Illinois, Wisconsin, Tennessee, Iowa, Minnesota, and in North and South Dakota. Material from nearly all these localities has been cited in the literature but generally identified erroneously as *Diestrammena marmorata* (De Haan), which is not known to occur in North America. In all probability this greenhouse pest will become very generally established in suitable situations over much of the United States, but, due to its environal requirements, control should not be particularly difficult. Bue and Munro have given important notes on its habits and control in greenhouses (E. S. R., 81, p. 670).

A new genus (Tumeus) and six new species of leafhoppers closely related to Cloanthanus (Homoptera: Cicadellidae), D. M. DeLong. (Ohio State Univ.). (*Bul. Brooklyn Ent. Soc., 38 (1943), No. 5, pp. 168–174, illus. 1*).—This group of leafhoppers seems to be well represented in the fauna of the southwestern United States and in Mexico. In recent work upon this material many species have been identified or described in *Cloanthanus*, but the small group treated here does not seem to belong to any previously described genus, hence the erection of the new genus *Tumeus*.

The ecological significance of the color phases of Colias chrysotheme in North America, W. Hovanitz (*Ecology, 25 (1944), No. 1, pp. 45–60, illus. 5*).—The North American distributions of two physiological races of this butterfly are described from an ecological standpoint. The orange race has extended its range everywhere with the growing of alfalfa. Apparently the occupation of new territory has been accompanied by a genetic acclimatization in the race caused either by environal selection or by intercrossing with the yellow race. The yellow race has essentially the same range as it had before the appearance of European man, but its abundance has increased in those parts of the range where white and red clovers are grown. The recently migrant but now resident orange race appears to have changed the genetic adaptability of the yellow race in a once pure "yellow" territory. The variation in frequency of a white genetic mutant existing within each race is described; in each the frequency is highest toward the north. The differences in the ecological distribution of the two races are shown to be due to the genetic physiological differences between them, viz, a potentiality for diapause for winter hibernation in the yellow race, a different food plant distribution in the two races, and different physical environal preferences.

Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America, I, R. E. Blackwelder (*U. S. Natl. Mus. Bul. 185 (1944), pp. 188+*).—The number of beetles recorded from America south of the United States is estimated to be near 50,000; "in order to keep a list of this large number within reasonable size, it has been necessary to make considerable compromises with what might be considered to be an ideal check list." In the arrangement selected, the following data are presented: A systematic arrangement of families and genera, an alphabetical list of the species in each genus with synonyms and varieties, a citation to the original publication of each name, and an indication of the known geographical distribution by countries. In part 1 the suborders Archostemata, Adephaga, and Polyphaga are included, the last to be continued in the next part. The preface is given in English, Spanish, Portuguese, and French.

A new genus and species of Coleoptera from Panama, M. W. Blackman. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 3, pp. 76–80, illus. 5*).—On *Mecopelmus zeteki* n. gen. and sp., host unknown.

Some new North American species of Epicauta (Coleop.: Meloidae), F. G. Werner (*Psyche, 50 (1943), No. 3–4, pp. 65–73*).—Descriptions of 22 new species of this genus of blister beetles are presented.

Descriptions of new Cynipidae including two new genera (Hymenoptera), L. H. Weld. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 3, pp. 55–66, illus. 4*).—This taxonomic paper, containing much new nomenclature, brings together miscellaneous descriptions and notes on members of the group and includes two new genera (*Paraschiza* and *Thrasorus*—subfamily Figitinae) of dipterous parasites and an account of the biology of a *Drosophila* parasite (*Pseudeucoila bochei* n. sp.) reared in large numbers under controlled laboratory conditions.

The appearance of Vespula squamosa Drury in Missouri, P. Rau (*Psyche, 50 (1943), No. 3–4, p. 114*).—A first record for this wasp in Missouri.

The insect pest invasion in Ohio in 1944, J. S. Houser (*Ohio Sta. Bimo-Bul. 227 (1944), pp. 83–85+, illus. 1*).—A practical discussion of probabilities and preparing for them.

Review of United States patents relating to pest control [January–December 1943], R. C. Roark (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control, 16 (1943), Nos. 1, pp. 7; 2, pp. 8; 3, pp. 8; 4, pp. 6; 5, pp. 6; 6, pp. 7; 7, pp. 7; 8, pp. 10; 9, pp. 6; 10, pp. 5; 11, pp. 7; 12, pp. 6*).—A continuation of this series (E. S. R., 89, p. 92).

Idaho recommendations for insect control, W. E. Shull (*Idaho Sta. Bul. 252 (1944), pp. 63*).—This includes a brief description of various injurious insects found in Ohio and suggested control measures.

[Insect control] (*Oreg. State Hort. Soc. Ann. Rpt., 35 (1943), pp. 33, 35–40, 65–72*).—The following papers are included: Outlook for Insecticides and Fungicides for 1944, by R. E. Rieder (pp. 33, 35–39) (Oreg. State Col.); Sprays and Dusts for Cherry Fruit Fly Control, by S. C. Jones (pp. 65–66) (Oreg. Expt. Sta.); Experiences in Controlling Orchard Diseases and Pests With Dust, by L. W. Tinker (pp. 68–70); and Experiences in Controlling Orchard Diseases and Pests With Sprays, by E. P. Hansen (pp. 71–72).

A catalogue of the parasites and predators of insect pests.—Section 1, Parasite host catalogue, I, II (*Belleville, Ont.: Imp. Parasite Serv., 1943, sec. 1, pts. 1, pp 151+; 2, pp. 99+*).—The objects in view in the preparation of these annotated lists were to show the parasites and predators of any host insect, as recorded in the literature; the alternate hosts of the parasites and predators, if recorded; and the geographical distribution of any insect recorded as a parasite, predator, or host. Although the records listed were taken in the main from *The Review of Applied Entomology*, Series A and B, volumes 1–25, original publications were also drawn upon to some extent. Parts 1 and 2 of section 1, here included, comprise, respectively, the parasites of the Arachnida and Coleoptera and of the Dermaptera and Diptera.

Control of wheat insects, F. A. Fenton and F. E. Whitehead (*Oklahoma Sta. Bul. 275 (1944), pp. 46, illus. 24*).—This contains an account and suggests control measures for the following insects infesting leaves, stems, and heads: Green bug, chinch bug, grasshoppers, armyworm, army cutworm, pale western cutworm, hessian fly, wheat stem maggot, brown wheat mite, and grain bug, as well as three groups which feed on roots—wheat white grub, wireworms, and false wireworms—and several stored wheat pests.

The wheat stem sawfly in Montana, H. B. Mills (*Montana Sta. War Cir. 6 (1944), pp. [7], illus. 3*).—A practical account of this insect and its control.

Bionomics of Ectopsocus pumilis (Banks) (Corrodentia: Caeciliidae), K. M. Sommerman. (Univ. Ill.). (*Psyche, 50 (1943), No. 3–4, pp. 53–64, illus. 15*).—*E. pumilis* adults have been taken in many of the Eastern States as far west as Missouri. Both sexes are known and the sex ratio is 0.5. The eggs are smooth-shelled and laid in masses covered with a loose network of threads. The nymphs and adults feed on fungus, pollen, starch, and embryos of corn kernels and on corn sheaths. The egg stage requires 6 days. The nymphs swallow air bubbles at hatching and at molting. The pronymphal membrane, with the egg burster attached, is always found protruding from the chorion after hatching. The antennae are 8-segmented in the first instar and 13-segmented thereafter. Wing pads appear on the third instar and about double their length with each molt. During molting the nymphs are in a vertical position with the head down. The nymphal stage requires about 17 days and the adult stage lasts about 30 days. The usual life span, including the time within the egg, is 53 days. Silk is deposited by all nymphs and adults. Winter is probably spent in the adult or nymphal stages.

Does early harvesting of peas check the pea weevil? A. W. Gull and A. B. Adams (*Jour. Dept. Agr. West. Austral., 2 ser., 20 (1943), No. 3, p. 265*).—Report of a case in which the pea weevil appeared to be controlled by harvesting peas while still green; the experience is passed along for further testing.

Sugarcane borer experiments, J. W. Ingram and A. L. Dugas. (U. S. D. A. and La. Expt. Sta.). (*Sugar Bul., 22 (1944), No. 11, pp. 84–87*).—Cooperative work begun in 1937 has shown that cryolite usually can be depended on to kill 90 percent or more of sugarcane borers of the first generation. Beginning in 1938, large-acreage experiments have been conducted to determine the harvest-time benefit of dusting with cryolite to kill first-generation borers; and the detailed results of experiments (1942) on four plantations, largely using synthetic cryolite containing not less than 85 percent sodium fluoaluminate, are here reported upon. These results in tons of cane and pounds of sugar per acre varied considerably according to local conditions, but in all cases the treatment proved of value. It is concluded from an experiment on the control of second-generation borers that the use of synthetic cryolite dust to reduce infestation in cane to be used for seed should be one of the ways in which this method of borer control can be applied with profit.

Host plants of the tobacco flea beetle (Epitrix parvula F.), E. H. Glass (*Virginia Sta. Tech. Bul. 85 (1943), pp. 22, illus. 13*).—Studies on the host plants of the tobacco flea beetle in Pittsylvania County from April to September showed that adults feed mostly on solanaceous plants, the order of importance being tobacco, horsenettle, potato, tomato, jimsonweed, black nightshade, the groundcherries, eggplant, and pepper. Rearing experiments were conducted with 29 plant species representing 11 families; but no adults emerged from any nonsolanaceous plants. More beetles developed on tobacco, potato, and jimsonweed than on any other Solanaceae tested. This study emphasizes the relationship between the tobacco plant bed and the flea beetle population. In instances where no control measures were practiced the plant bed served as a breeding place for beetles, but when insecticides were applied and the flea beetles destroyed the bed was not a source of infestation.

The cabbage looper as a pest of lettuce in the Southwest, K. B. McKinney (*U. S. Dept. Agr., Tech. Bul. 846 (1944), pp. 30, illus 10*).—These studies cover the biology and control of the cabbage looper for 1933 to 1938, inclusive. During years and seasons of sufficient rainfall over the desert areas large numbers of the looper breed on the wild plants, and apparently the adults migrate to the cultivated areas in adjusting themselves to the food-plant sequences. The

spring crop of lettuce is grown during the winter when the looper activities are at their lowest, while the fall crop is grown at a time when the loopers are more abundant and therefore it is subject to attack year after year. The more serious damage usually occurs immediately after thinning, when the larvae infesting the discarded plants find their way to and congregate on those left standing. Soon after thinning, the rapidly growing plants become established and outgrow subsequent infestations and the crop is marketed practically free of looper injury.

The eggs of the cabbage looper are deposited singly on either side of the leaves and hatch in from 3 to 10 days. The feeding period of the larvae lasts from 10 to 50 days, and there are four or five larval stadiums. The fragile cocoons are usually attached to the lower leaves, and during the summer the pupal stage may last as few as 6 days, or the winter may be passed as pupae. All stages of the insect may be found throughout the year. The adults are strong fliers and may cover long distances, and as many as 200 eggs are deposited by a single female. All stages of the looper may be attacked by parasites or predators, and the combined effect of the natural enemies and the practice of growing lettuce during the fall and winter allows the crop to be made with a minimum of artificial control.

From a study of plant-growth records it was concluded that lettuce could be treated with poisonous insecticides up to within 35–40 days of harvest without leaving an objectionable residue to reach the consumer. Under irrigated conditions of the Southwest derris dusts were very toxic to the loopers and cryolite or paris green could be used to control loopers on small lettuce, but when a mixed infestation of cabbage loopers and beet armyworms occurred calcium arsenate was more effective for controlling the combined infestation than derris and equal to the cryolite or the paris green. Applications of insecticides ranging from 10 to 20 lb. per acre, depending on the size of the plants and the kind of insecticide, will control the loopers. Insecticides are preferably applied 3–5 days previous to thinning to avoid a concentrated attack on the plants left standing. Insecticides applied before thinning will not be present on the product that reaches the consumer.

The biology and control of the striped cucumber beetle, G. E. Gould (*Indiana Sta. Bul. 490 (1944), pp. 28, illus. 2*).—The striped cucumber beetle is the most important insect attacking cucumbers, cantaloups, and watermelon in Indiana and losses from this pest are estimated at about $500,000 per year. Adults are destructive to both seedlings and mature plants because of their feeding activities throughout the season. Larvae feed on roots and weaken or kill many plants, and the beetles spread bacterial wilt from diseased to healthy plants. The latter is perhaps the most serious problem caused by this insect. Two generations occur annually in Indiana, but they overlap so that there is a large population of beetles from late April until frost in the fall. Females deposit eggs in loose, moist soil near the roots; these eggs hatch in 6–8 days, and the young larvae feed on the roots for a period of 14–20 days. Pupation occurs in a small cell formed in the soil nearby, and after about 6 days in the pupal stage the adult emerges. Second-brood adults emerge from August 20 to frost, and after entering hibernation in the fall some have been found to live until the following August. Apparently the second-brood adults live 10–11 mo., whereas the first-brood adults live only about 2½ mo. Hibernation occurs under leaves and other debris on south slopes in wooded areas. A tachinid fly, *Chaetopheps setosa* Coq., parasitized from 10 to 30 percent of the adults during the summer months.

Under field conditions for both cucumbers and cantaloups, 20 percent calcium arsenate and enough of an insoluble copper compound so that the mixture analyzes 3 percent metallic copper proved most suitable. A mixture of 20 percent

cryolite also gave satisfactory kills, while one containing 20 percent calcium arsenate alone ranked third. Although rotenone mixtures resulted in satisfactory beetle control, these had little residual effect, since the plats were infested on the second or third day. Barium fluosilicate mixtures killed the adults but caused severe burning and stunting of the plants. It is suggested that cucumber plants should have applications of insecticides the first day the plants appear, then on the fourth, eighth, thirteenth, eighteenth, twenty-fourth, thirtieth, and thirty-seventh days. An acre could be treated with calcium arsenate-insoluble copper mixture for about $11 and with a 20-percent calcium arsenate dust or 20-percent cryolite dust for about $6; the application of a 0.75-percent rotenone dust costs approximately $18 an acre. Yields from treated cucumbers and cantaloups were more than double those of untreated areas during most of this study.

A bibliography of 65 titles is appended.

Development and characteristics of vigorous or resistant strains of codling moth, W. S. Hough (*Virginia Sta. Tech. Bul. 91 (1943), pp. 32, illus. 9*).—In comparative tests, codling moth larvae from sprayed commercial orchards showed from two to five times greater ability to enter sprayed fruit than larvae from unsprayed home orchards. Several strains of codling moth larvae known as K strains were produced when larvae were reared continually in the laboratory on apples sprayed with lead arsenate. Observations were made on these strains as to number of eggs deposited, rate of oxygen consumption, oxygen intake of eggs, and weight of eggs and mature larvae or moths. Results of this investigation show that a change in codling moth population of commercial orchards has taken place, and that this pest possesses increased vigor or resistance in comparison with the resistance of moths living in unsprayed isolated orchards. This resistance can be increased by toxic selection through spraying, since insecticides apparently tend to eliminate less resistant larvae. This resistance seems to be one of general vigor characterized by increased ability to enter fruit sprayed with certain insecticides and by increased ability of the larvae to attack the fruit. Increased resistance was accompanied by a decrease of metabolism in eggs from which the young larvae were to emerge within a few hours.

Advances in codling moth control, G. E. Marshall. (Purdue Univ.). (*Amer. Fruit Grower, 64 (1944), No. 2, pp. 12, 24, 35, illus. 11*).—A report of outstanding control of codling moth in a 30-year-old apple orchard of trees ranging in height up to 32 ft. in southern Indiana, as showing that there are now several spray programs using lead arsenate and at least two or three containing no lead arsenate which control the heaviest infestations under conditions in this State.

Leafhoppers—can they get the cream of the crop? N. F. Childers. (Ohio State Univ.). (*Amer. Fruit Grower, 64 (1944), No. 2, pp. 10, 28–29, illus. 3*).—Based largely on work by Ohio State University, the author presents a general discussion of injuries to apple and grape and of life histories, habits, and control, with particular reference to the white apple leafhopper, a grape leafhopper (*Erythroneura* sp.), and, to a minor extent, the potato leafhopper. For detailed spray schedules to control both apple and grape leafhoppers, growers are referred to their respective experiment stations. The active spray is said to be usually nicotine as 40 percent nicotine sulfate, or a powdered material known as Black Leaf 55, which appears to show considerable promise.

The grape plume moth, with notes on other pests of grapes in Massachusetts, I, II (*Massachusetts Sta. Bul. 409 (1943), pp. 20, illus. 7*).

I. *The grape plume moth,* W. D. Whitcomb and W. E. Tomlinson, Jr. (pp. 3–13).—The grape plume moth is present in the majority of home vineyards in eastern Massachusetts. One generation occurs annually, and the moths, which are weak fliers, deposit eggs in the pubescence of the canes at the axils of the shoots. Larvae do not leave the eggshell until the following year. Pupation

occurs in late June, and the adults emerge and deposit eggs in July. The vines are injured by the larvae feeding in the opening bud and at the tip of the new shoots, where they fasten a few leaves into a nest. Few blossom buds are damaged, and the loss of fruit is slight. Careful pruning by one of the standard systems removes 70 percent or more of the eggs, which is an important factor in controlling this pest. The most satisfactory control was obtained by spraying with 3 percent oil emulsion or 1 percent sodium dinitrocresylate to kill the eggs. The spray should be applied about April 15 when the buds are still dormant.

II. *Notes on other pests of grapes in Massachusetts*, W. D. Whitcomb and E. F. Guba (pp. 14–19).—Includes information on the rose chafer, grape berry moth, grape leafhopper *Erythroneura comes* (Say), grape rootworm, brown grape aphid *Macrosiphum illinoisensis* (Shimer), grape flea beetle, grape cane girdler *Ampeloglypter ater* (Lec.), Japanese beetle, and the following grape diseases: Black rot, downy mildew, and powdery mildew, with suggestions for their control.

Up to now with citrus insecticides, A. M. Boyce. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 5, p. 117*).—A brief summary of results, especially with some of the newer insecticides such as DN, D8, DN–111, rotenone, tartar emetic, and DDT (Gesarol).

Spraying and dusting for filbert worm control, B. G. Thompson. (Oreg. Expt. Sta.). (*Oreg. State Hort. Soc. Ann. Rpt., 35 (1943), pp. 96–98*).—The recommended control for the filbert worm has been a poison spray applied before the eggs hatch; in early tests poisons applied as dusts gave slightly less control. Since the present scarcity of labor and spray machinery has made spraying in many orchards impossible, further tests with dusts were made in which 40 lb. to the acre of a 40-percent lead arsenate dust, with good coverage, gave results comparable with those from a liquid spray. A good coating of the under sides of the leaves, however, is required for satisfactory control.

Rearing notes on Gracillaria sassafrasella (Chamb.), E. P. Darlington (*Ent. News, 55 (1944), No. 2, pp. 40–41, illus. 2*).—Believing that a fuller description of the larval history of this common under-side miner on sassafras leaves might facilitate its detection, the author presents brief notes from his rearing and observational records.

The ring-legged earwig (Euborellia annulipes (Lucas)), **a new greenhouse insect in Ohio**, C. R. Neiswander (*Ohio Sta. Bul. 648 (1944), pp. 14+, illus. 5*).—During the 5-yr. period the ring-legged earwig has been investigated in Ohio significant damage has been caused in only one greenhouse. A poison bait containing 12 oz. of paris green, 12 lb. of bran, 2 qt. of molasses, and 6 qt. of water, broadcast in the evening at the rate of 1 lb. to 4,000 sq. ft., gave satisfactory control. Since the pest does not spread rapidly and is easily controlled, the author does not believe that this earwig will become a serious pest of greenhouse crops.

The chemical destruction of forest pests, L. L. Ossowski (*Endeavour [London], 3 (1944), No. 9, pp. 32–37, illus. 8*).—The author reviews (15 references) the magnitude and causes of the outbreaks of insect plagues in the last 50 yr., the extent of effective control, and the development of the most important methods hitherto elaborated and briefly describes the present scientific position as regards control measures.

Livestock insect control: A study of insects which attack livestock and means for their practical control, [I], II, E. G. Thomssen and M. H. Doner (*Soap and Sanit. Chem., 19 (1943), Nos. 11, pp. 96–103, 117, illus. 1; 12, pp. 131–141*).—This is a general review and summary of the subject (46 references). Activity now centers around the development of new and better insecticides for destroying external parasites of livestock and poultry; the newer synthetics are

fast replacing the older methods of control, in many cases with better results attained more economically. Part 1 lists some 20 groups of flying insects attacking livestock, and discusses the manner in which insects affect livestock and the control of flying insects and animal infestations. Part 2 considers the various crawling pests (mites, lice, ticks, etc., listed by hosts), their effects on livestock and poultry, role as disease carriers, habits and methods of spread, treatment of animal infestations (including a list of dips for different pests on the various domestic animals) and of infested premises, and a summary of new and old angles in control.

A noxious species of Phlebotomus in the Okefenokee Swamp, Georgia, O. A. Johannsen. (Cornell Univ.). (*Psyche, 50 (1943), No. 3–4, pp. 112–113*).—A note on encountering an undetermined species of blood-sucking flies of this genus differing from *P. vexator* Coq.

Ants causing death in poultry, C. F. H. Jenkins (*Jour. Dept. Agr. West. Austral., 2. ser., 20 (1943), No. 3, p. 264, illus. 1*).—A note on the death of fowls from eating ants, with a report of a case due to ingestion of *Monomorium bicorne.*

The intersection line as a factor in anopheline ecology, A. D. Hess and T. F. Hall (*Jour. Natl. Malaria Soc., 2 (1943), No. 2, pp. 93–98, illus. 2*).—The intersection line is defined as the line of intersection between three interfaces—water-air, water-plant, and plant-air; intersection value, as the number of meters of intersection line per square meter of water surface. A high positive correlation between the intersection value and the population density of larvae of the common malaria mosquito was indicated by the 111 samples collected in floating leaves of lotus (*Nelumbo lutea*). The intersection line theory is believed to offer an explanation for a number of puzzling situations with regard to the biology and control of anopheline larvae.

The measurement of a population of Anopheles quadrimaculatus Say, D. E. Eyles and W. W. Cox (*Jour. Natl. Malaria Soc., 2 (1943), No. 2, pp. 71–83, illus. 3*).—A method for measuring the real density of females of the common malaria mosquito is presented, and the results of three efforts to apply it in the vicinity of Reelfoot Lake, Tenn., are given. In this area of exceptionally high mosquito density the average number of females of this species was found to be 11,000 per acre, this count being derived from three measurements in July and August. Possible sources of error in the method are pointed out.

A method for catching, marking, and reexamining large numbers of Anopheles quadrimaculatus Say, D. E. Eyles (*Jour. Natl. Malaria Soc., 2 (1943), No. 2, pp. 85–91, illus. 5*).—A method of catching large numbers of the common malaria mosquito with no ill effects on them is described. With the apparatus developed, the principal factor limiting the number of mosquitoes which may be caught is their availability. A second apparatus for quickly catching mosquitoes for killing is described. Attention is called to the use of metallic bronzing dusts for marking mosquitoes and the technic of marking is explained. The advantage of this medium is that labeled insects may be detected macroscopically; the technic of detection is also explained.

A practical entomological course for students of malariology, I. M. Puri ([*India*] *Health Bul. 18 (Malaria Bur. No. 9), 3. ed., rev. (1942), pp. 189+, illus. 168*).

Entomological services in the regulation of the larvicide program (*Jour. Natl. Malaria Soc., 2 (1943), No. 2, pp. 21–28, illus. 3; pp. 29–30*).—Pages 21–28, by G. H. Bradley and H. G. Hanson, give a general review of the institution of standard entomological procedures for guiding a control program around the hundreds of war areas scattered throughout the malarial sections of the United

States and with particular reference to the common malaria mosquito, the species constituting the main problem in this country. Pages 29–30, by H. L. Fellton, consists of a brief note emphasizing the fact that entomologists form a sort of "intelligence unit" for the malaria control program in war areas; some of the salient points in this service are enumerated.

Development of entomological service of the Fourth Service Command Laboratory as applied to the Army's mosquito control program, W. V. King and D. M. Kuhns (*Jour. Natl. Malaria Soc., 2 (1943), No. 2, pp. 39–47, illus. 4*).—A mosquito survey and diagnostic service was organized by the Medical Department of the Army at Fort McPherson, Ga.; instructions for collecting mosquitoes and recording data were made uniform for all camps, and specimens were submitted to the laboratory for identification. In the control program stress was laid on the principle of species control and the development of a greater species consciousness among the antimosquito personnel. The 10 species most important for the area as vectors or pests are listed. The system of weekly collections has provided an index of the mosquito population at each of the camps where adequate records were obtained, and the tabulated records furnished immediate information on the status of the important species and the effectiveness of the control work. Similar records for the anopheline species were obtained by Federal and State workers in the extra-cantonment zones. As a result of extensive collections, *Anopheles georgianus* was found to be much more widely distributed than previously known, having been recorded from every State in the Fourth Service Command except Tennessee; there is, however, no evidence that it is important as a malaria vector.

Another use for the cockroach, Blatta orientalis, P. Rau (*Ent. News, 55 (1944), No. 2, pp. 49–50*).—A note on the use of the oriental cockroach as fish bait in Tennessee.

ANIMAL PRODUCTION

The apparent digestibility and nutritive value of several native and introduced grasses, R. McCall, R. T. Clark, and A. R. Patton (*Montana Sta. Bul. 418 (1943), pp. 30, illus. 3*).—The composition, average digestible nutrients, and nitrogen balances of grasses consumed in 10-day balance trials with six lambs each are reported for several grasses. They were harvested in the early part of the flowering stage, from plants produced under dry-land conditions, in 1938, 1940, and 1941. Russian wild-rye, slender wheatgrass, and mountain brome ranked high in total digestible nutrient content; orchard grass and tall oatgrass about average; fairway crested wheatgrass, standard crested wheatgrass, downy chess, and alta fescue, average or slightly below average; and smooth brome lowest in nutrient content. Russian wild-rye contained a high proportion of digestible crude protein in which both standard and crested wheatgrasses were high. Nitrogen storage was attained only by lambs fed Russian wild-rye, although there were no large losses of nitrogen. The yield of Russian wild-rye was rather low even though there were considerable weeds in the stand. However, it would probably have a high pasture value because of its earliness, drought resistance, rapid regrowth after cutting, palatability, and high digestibility. The most palatable grasses in the 3 yr. of the study were for 1938, standard crested wheatgrass; 1940, fairway crested wheatgrass and slender wheatgrass; and 1941, Russian wild-rye. Because of the short duration of the feeding periods, weight changes were of relatively little value. The digestibility of ether extract and lignin showed greater variation than other nutrients. Crude fiber was divided in 1940 and 1941 into lignin, cellulose, and other carbohydrates. The largest retention of lignin was from Russian wild-rye, but it probably was of small value to the animal.

[Stabilization of the vitamin content of alfalfa leaf meal] (*Wisconsin Sta. Bul. 461 (1943), p. 44*).—If the meal is moistened and heated to 203° F. for 3 hr., it generally retains about 80 percent of its carotene for 6 mo., whereas untreated meal retains only about 30 percent during such a period.

Cystine content and enzyme digestibility of powdered hoof proteins, H. S. Olcott. (U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 2, pp. 219–220*).—Following growth responses of rats and chicks to powdered swine hoofs obtained by Wagner and Elvehjem (E. S. R., 89, p. 582), it was found that the major part of cattle, horse, and swine hoof powders were digestible in vitro by proteolytic enzymes and that the undigested residue contained more cystine than the total hoof protein. There was an inverse relation between the cystine content and the digestibility by pancreatin in different parts of cattle hoofs. The soft part contained less cystine and was more readily digested than the hornlike front portion.

The digestibility of wheat straw and wheat-straw pulp, W. S. Ferguson (*Biochem. Jour., 36 (1942), No. 10–12, pp. 786–789*).—The digestibility of wheat straw and pulp from wheat straw treated with sodium hydroxide was ascertained with six sheep. There was a marked increase in digestibility of all constituents except lignin as a result of the alkali treatment. Lignin was totally indigestible. The rations consisted of 600–700 gm. of straw dry matter and 100 gm. of casein for a 10-day collection period following a 4-day preliminary period.

Alfalfa hay as the roughage in cattle-fattening rations, J. H. Knox and P. E. Neale (*New Mexico Sta. Bul. 310 (1943), pp. 14, illus. 4*).—Study was made of feeding four lots of 10 fleshy long-yearling Hereford steers in each of 3 yr., for 189, 168, and 168 days, respectively, on rations of ground kafir, cottonseed meal, and alfalfa hay. First-cutting alfalfa hay was used in one lot, with third-cutting provided in the other three lots each year. In one lot with third-cutting alfalfa hay the bulk was increased with cottonseed hulls, and in one kafir and cottonseed meal consumption was limited to about half that of the other lots. The average daily gain of the limited group was reduced to about 1.75 lb., as contrasted with slightly more than 2 lb. in the other lots. Considerable bloat occurred, especially with first-cutting alfalfa hay. It appeared that bloat was more frequently caused by fine leafy hay than by the coarser hay from third instead of first cutting. The danger of bloating was reduced materially by the use of cottonseed hulls. No trouble was encountered from bloating in the lots receiving one-half the amount of grain and large quantities of alfalfa hay. Greater grain consumption and reduced amounts of alfalfa hay were followed within a few days by serious bloat. However, this was avoided by allowing the cattle all the hay they would eat. Bloating was more serious with fine hay, although gains were greater than with coarser third-cutting alfalfa.

Corn and alfalfa substitutes for fattening cattle, R. R. Thalman (*Nebraska Sta. Bul. 355 (1944), pp. 40*).—Adding corn silage to a ration of shelled corn and alfalfa hay in a 140-day feeding test with 2-year-old steers reduced the amounts of feed required per unit of gain. When the amounts of corn fed with alfalfa hay were limited to approximately 12, 14, and 16 lb. per head daily, the gains were greater with the larger amounts of corn, but the amount of corn required per unit of gain was also greater and the amount of alfalfa hay consumed decreased. With greater corn consumption the steers were fatter and brought slightly higher prices. Lots of heifer calves and yearlings wintered for 150 days on corn silage and cottonseed cake, with additional shelled corn provided to two of the lots, were finished on a limited amount of silage, cottonseed cake, and a full feed of ground shelled corn. For these groups, the finishing required 53 days for the yearling heifers wintered with limited amounts of corn, 67 days for calves wintered with limited corn and yearlings wintered without

corn, and 81 days for calves wintered without corn. There was no difference in the average daily gains of the two lots of calves during the finishing period. Five lots each of yearling heifers and heifer calves were used for comparing varying levels of cracked corn and cane molasses in rations of grainless corn silage and cottonseed cake for feeding and fattening. Heifers receiving no corn made substantially poorer gains and were inferior to other lots. Differences between other lots were not great. Similar results were obtained in comparisons of varying amounts of cane molasses and corn in rations of five lots of heifer calves. In one trial of 96 days' duration, heifer calves fed cane molasses ate slightly more feed, required greater amounts of feed per unit of gain, and were fatter than heifer calves receiving corn molasses. The average of three trials of 160, 127, and 150 days' duration showed that there was no advantage in adding alfalfa-molasses feed to a ration of shelled corn, corn silage, and alfalfa hay for fattening 2-year-old steers. The average daily gains of 3-year-old steers were increased from 3.06 lb. on a ration of shelled corn and alfalfa hay to 3.61 lb. on a ration of two-thirds shelled corn and one-third cracked wheat with alfalfa hay in a 65-day feeding period. Corn, barley, oats, and wheat were compared for heifers and steers singly and in combination. There was some difficulty in keeping yearling heifers on feed with rations containing ground wheat. Yearling steers made slightly better gains on shelled corn than when about half of it was replaced by hominy feed. Heifer calves and steers made slightly larger gains on rations of shelled corn, cottonseed meal, alfalfa hay, or alfalfa hay and corn silage than when there were added 2 lb. of Tarkio-molasses feed per head daily. Satisfactory gains were made by yearling steers when wheat straw partially or completely replaced alfalfa hay. In these trials the lots varied from 8 to 25 head.

Performance-testing of beef cattle, R. T. Clark B. Knapp, Jr., A. L. Baker, and J. R. Quesenberry. (Coop. U. S. D. A.). (*Montana Sta. Bul. 417 (1943), pp. 12, illus. 6*).—A group of 8 random-selected steer progeny from each of 11 purebred Hereford bulls was compared as to weaning weight, gains in the feed lot, final weight, occurrence of digestive disorders, carcass grade, feed cost per 100 lb., sale value, and gross returns per steer above feed and marketing costs. Although variations between sire groups were not great, differences between the progeny of certain bulls were noted.

Management of sheep on range infested with orange sneezeweed, C. W. Doran and J. T. Cassady. (Coop. Colo. State Col.). (*U. S. Dept. Agr. Cir. 691 (1944), pp. 28, illus. 16*).—Detailed daily observations are presented of good, fair, and poorly managed bands of about 1,000 ewes and their lambs during the summer grazing season on ranges heavily infested with the poisonous orange sneezeweed. Good management of the bands reduced death losses to one-sixth of those suffered under poor management, and increased the average lamb weight 8–10 lb. Recommended management practices included light grazing and avoidance of early spring grazing of sneezeweed-infested ranges; removal of sheep from such areas in the early fall when desirable associated forage begins to wither, so that these types are not too closely grazed; practice of open, quiet herding; uniform use of the range; establishment of one-night bedding grounds which have been carefully selected so that damage from previous use will be avoided; and grazing during daylight hours in order to permit better observations. No practical control of generalized sneezeweed infestations was found. Light infestations could be controlled by grubbing.

Sheep of the Andes, E. P. Tappy (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 4 (1944), No. 3, pp. 46–50, illus. 5*).—General descriptions and history are given of the llama, alpaca, guanaco, and vicuña, members of the sheep family used for wool and lamb production.

War time feeding and management of hogs, S. S. Wheeler (*Wyoming Sta. Bul. 265 (1944), pp. 43, illus. 18*),—The use of home-grown grains with alfalfa as pasture and dry-lot feeding, insofar as possible for wartime hog feeding, is suggested. Certain animal proteins or mixtures of plant proteins, as well as minerals and vitamins, seem essential.

The brood sow and litter: Feeding and management, E. L. Quaife (*Iowa Sta. Bul. P59 (1944), pp. 905–920, illus. 5*).—General directions are given for the development and breeding of gilts and sows, the feeding and management of sows during pregnancy, farrowing, and nursing, and the care and feeding of young pigs.

The use of electric heat in the farrowing pens of young pigs, G. H. Foster and C. M. Vestal (*Indiana Sta. Bul. 494 (1944), pp. 14, illus. 6*).—Death losses of 208 pigs born in 25 litters at the station and brooded to 10 days of age without heat were 46.2 percent. At the same time 26 litters of 229 pigs provided with supplemental heat for 10 days lost only 29.7 percent up to 10 days of age. More pigs were also raised during this period in 54 early spring litters on three cooperating farms when supplemental heat was provided. Although losses were materially reduced, the greatest reduction from the use of supplemental heat was in the loss from chilling. The supplemental heat was provided by an electric flood lamp, an electric bulb with reflector, and an electric underheat unit to the different lots.

Pantothenic acid deficiency in swine, with particular reference to the effects on growth and on the alimentary tract, M. M. Wintrobe, R. H. Follis, Jr., R. Alcayaga, M. Paulson, and S. Humphreys. (U. S. D. A. et al.). (*Bul. Johns Hopkins Hosp., 73 (1943), No. 5, pp. 313–341, illus. 12*).—Continuing the study of the effect of deficiencies of the B complex in swine (E. S. R., 88, p. 799), observations on 18 pigs showed that pantothenic acid deficiency in the young pig was characterized by diarrhea, then dysentery, and loss of appetite, reduced growth, loss of hair, cough and excessive nasal secretion, changes in the tongue, and abnormal gait. When inadequate amounts of pantothenic acid were given the pigs gained no more than 20–92 gm. per day and one lost weight, but gains were increased to over 400 gm. per day by feeding 500 μg. of pantothenic acid per kilogram of pig. In pantothenic acid deficiency there was extensive colitis, and microscopic examination of the alimentary tract revealed hyperemia, adema, and ready bleeding. With deficiency there developed a moderate normocytic anemia, a fall of serum chlorides, increase in the carbon dioxide combining power of the blood, and sometimes hypoglycemia. The abnormal gait which was associated with the histological changes in the nervous system improved but was not completely restored following administration of calcium pantothenate.

30 years stallion enrollment in Indiana.—Report of stallion enrollment board for the year 1943, with lists of stallions and jacks enrolled (*Indiana Sta. Cir. 293 (1943), pp. 38, illus. 1*).—The usual report of stallions and jacks enrolled for service in 1943 in Indiana (E. S. R., 89, p. 472).

Wartime feed mixtures for chickens, H. W. Titus, J. C. Hammond, and D. Whitson (*U. S. Dept. Agr., 1943, AWI–48, pp. 6*).—A discussion of the limitation on proteins, with suggested all-mash rations for starting chicks; growing, laying, and breeding mashes; and substitutes for fish meal, meat scrap, dried skim milk, and alfalfa meal.

Why animal by-products are fed to poultry, D. C. Kennard (*Ohio Sta. Bimo. Bul. 227 (1944), pp. 113–118*).—As plant proteins usually contain less minerals than animal proteins, comparison was made of the egg production of hens receiving 20 percent meat scrap with other lots receiving one-half of this amount with and without minerals or cottonseed meal with and without minerals. When properly supplemented with the minerals and vitamins found in meat, fish,

and milk products, plant proteins promoted satisfactory egg production. The average annual egg production of Barred Plymouth Rock and White Leghorn pullets on rations of 20 percent meat scrap was 148 and 124, respectively. Egg production in both breeds averaged 110 when the meat scrap was reduced to 10 percent. However, when 2 percent minerals was also included, egg production averaged 140 and 125, respectively. When the protein consisted of 20 percent cottonseed meal with and without 4 percent minerals, egg production averaged 105 and 49, respectively, for the Leghorns. The experiment was conducted from October 19, 1922, to October 17, 1923.

Isolation of the antianemia factor (vitamin B_c) in crystalline form from liver, J. J. Pfiffner, S. B. Binkley, E. S. Bloom, R. A. Brown, O. D. Bird, A. D. Emmett, A. G. Hogan, and B. L. O'Dell. (Univ. Mo. et al.). (*Science, 97 (1943), No. 2522, pp. 404–405*).—The chick antianemia factor B_c (E. S. R., 91, p. 65) was crystallized from a water extract of liver in clusters of thin yellow spear-head-shaped platelets containing approximately 50 percent carbon, 5 percent hydrogen, and 20 percent nitrogen. Administered to day-old chicks in a prophylactic test at a level of 2.5γ per gram of deficient ration, the chicks weighed 196 gm. and exhibited no anemia after 4 weeks. On the basal ration only chicks averaged 76 gm. in weight. In a concentration of 0.00005γ per cubic centimeter of culture media, the recrystallized vitamin B_c produced approximately half-maximum growth of *Lactobacillus casei* in a microbiological test. The chick antianemia factor, Peterson's eluate factor, and Williams' folic acid factor are probably the same.

The effectiveness of a mixture of arginine, glycine, and cystine in the prevention of the so called vitamin B_4 deficiency in the chick, G. M. Briggs, Jr., T. D. Luckey, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 150 (1943), No. 1, pp. 11–15*).—Additions of 0.5 percent arginine, 3 percent glycine, and 0.3 percent cystine to a basal ration of dextrin, crude casein, salts, yeast, autoclaved liver residue, and cod-liver oil, which was deficient in vitamin B_4, promoted very good feathering, and an average weight of 329 gm. at 5 weeks of age was attained. The basal ration only produced fair feathering and average weights of 189 gm. at 5 weeks. Supplements of each one of these amino acids, cartilage, vitamins A and D, and vitamin B_1 to the basal ration did not promote gains or comparable feathering. In the conduct of the experiment there were employed 10 lots of 6 chicks each, with 12 for the controls.

A tracer study with Mn on chicks with perosis produced by a synthetic manganese deficient diet, M. S. Mohamed and D. M. Greenberg (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 2, pp. 197–200*).—Perosis was produced in chicks on a synthetic ration lacking Mn but containing adequate Ca and P. Tracer studies with Mn showed that chicks on the Mn-deficient ration were retarded in weight and showed evidence of perosis in 2 weeks. Groups of four chicks each from deficient and control rations were given, orally and subcutaneously, 1 cc of a solution containing 15.8 μg. of Mn dissolved in 0.9 percent NaCl. The major part of the Mn was excreted by both deficient and control chicks regardless of the method of administration. The liver was the most active of the glands in the body in metabolism of Mn. The uptake of labeled Mn was not measured from orally administered doses.

Preincubation humidity variation effects on chicken egg hatchability, W. T. Cooney (*Oregon Sta. Tech. Bul. 2 (1943), pp. 27, illus. 10*).—In five hatches of a total of 5,239 Single Comb White Leghorn and Rhode Island Red eggs subjected to different humidities prior to incubation, it was found that a comparatively high relative humidity during the holding period for 4–14 days increased the hatchability from 54.5, 56.1, and 55.6 percent for the eggs in three lots held

under average conditions to 61.1 percent for eggs held in an insulated room with a humidifier and cooler in which the humidity was increased. The hatchability of fertile eggs was also increased.

DAIRY FARMING—DAIRYING

A method of equalized feeding for studies with dairy cows, H. L. Lucas. (Cornell Univ.). (*Jour. Dairy Sci., 26 (1943), No. 11, pp. 1011–1022, illus. 2*).—A method of equalized feeding which prevents biases in ration comparisons introduced by the usual method of periodically adjusting feed intake is discussed. The new method consists of periodically changing the concentrate intakes of all animals in an experiment to exactly the same percentage of their initial intake of concentrates. The roughage intake is maintained constant for each animal. Differences of about 3.5–5 percent could probably be demonstrated as significant when using equalized feeding with about 20 animals in the continuous trial and differences of 2–3 percent in the change-over trial.

Single grains and grain mixtures as supplements to alfalfa hay and silage for milk production, J. R. Dawson, A. L. Watt, C. W. McIntyre, R. E. Leighton, and R. W. Graves (*U. S. Dept. Agr. Cir. 696 (1944), pp. 11*).—When cows had access to as much alfalfa hay and silage as they liked it made little difference in butterfat production whether additional nutrients were obtained from a single grain or a mixture of several grains. One group of four cows at each of three field stations of the Bureau of Dairy Industry were fed limited amounts of a single grain—ground barley, corn, or kafir—and the other group limited amounts of a grain mixture, including from four to six different grains, grain byproducts, and high-protein concentrates. The single-grain rations produced 95 percent as much butterfat as the mixed-grain rations. Two groups of four cows were fed at each of the stations over single lactation periods.

The relation of the kind of pasture crop to the weed content of the forage, W. B. Nevens. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 9, pp. 877–882*).—The weed content of forage clipped from several pastures over an 8-yr. period, 1935–42, was ascertained as alfalfa 26 percent, bluegrass 15, bromegrass 12 and less than 0.5 (in the second year), winter rye 0, and Sudan grass-soybeans 2 percent. Alfalfa forage in the spring had a smaller weed content than later in the season, but the situation was reversed with bluegrass. Close grazing of the crops was likely to increase weed growth. Bromegrass, winter rye, and Sudan grass-soybean pastures were recommended for dairy cattle because of their low weed content and high yield.

Certain dietary factors essential for the growing calf, N. S. Lundquist and P. H. Phillips. (Univ. Wis.). (*Jour. Dairy Sci., 26 (1943), No. 11, pp. 1023–1030, illus. 4*).—Analyses of the blood of newborn calves before nursing were made for vitamins A and C and carotene. The level of vitamin C in the blood at birth was about twice normal for older calves. The drop was especially rapid during the first 24 hr. This vitamin was essential in protecting the calf from navel ill, peritonitis, and other active infections. Vitamin C synthesis seemed to begin at about 2–3 weeks of age, as the blood plasma C increased materially from about 14 to 21 days in calves raised on a skim milk ration. The vitamin C of the blood could be maintained for about 10 days by feeding, but thereafter C must be injected to be effectively recovered in the blood stream. The blood concentration of vitamin A and carotene was sufficiently low at birth to cause the calf to be vitamin A deficient. Evidently the very young animal cannot convert carotene into vitamin A. Administration of vitamin A and nicotinic acid controlled all types of calf scours thus far encountered except that associated with septicemia in the newborn. Vitamin A and pantothenic acid

were ineffective. "On the basis of these data, Holstein calves can be raised from birth on a diet of skim milk with added amounts of vitamins A, C, D, nicotinic acid, and access to hay and grain." Observations were made on the blood of Holstein, Jersey, and Brown Swiss calves at different ages from birth to 6 weeks. Some received various rations and vitamins.

Comparison of limestone and sodium bicarbonate as neutralizers for phosphoric acid oat silage, W. A. King. (N. J. Expt. Stas). (*Jour. Dairy Sci., 26 (1943), No. 11, pp. 975–981*).—Sodium bicarbonate was about twice as efficient as limestone in counteracting the acidity induced in the urine and blood of dairy cows fed oats silage made with additions of 20 lb. of 68 percent phosphoric acid per ton. When the phosphoric acid oat silage was fed alone over a 28-day period to three cows the pH of the urine dropped from about 8 to 5.9 and the ammonia excretion increased from an average of 111 mg. per 24 hr. to over 2,000 mg. and the fixed CO_2 decreased from an average of 482 mM to about 20 mM per 24 hr. Supplements of lime and sodium bicarbonate were administered separately and together to three cows over portions of a 149-day period in sufficient amounts to neutralize 1, 2, and 3 hydrogens of the phosphoric acid in the silage consumed. The pH of the urine was changed back to approximately 6 with sufficient lime to neutralize 2 hydrogens. Sodium bicarbonate and limestone fed in sufficient amounts to neutralize 2 hydrogens of the phosphoric acid in the silage were adequate, and the combination was probably the most satisfactory for practical purposes. To further substantiate the neutralizing effects of sodium bicarbonate on the urine, two other cows received a sufficient amount to neutralize 1 hydrogen in the silage. There was an immediate return toward normal of the ammonia and pH of the urine but the change in fixed CO_2 was not marked. A grain mixture with 2 percent limestone mixed with alfalfa and timothy hay proved ineffective in preventing acidosis when the phosphoric acid oat silage was fed over a 100-day period.

The effect of fat upon the digestion of nutrients by dairy cows, H. L. Lucas and J. K. Loosli (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 3–11*).—Continuing studies at the [New York] Cornell Experiment Station, summarized by Maynard et al. (E. S. R., 86, p. 82), of fat utilization of dairy cows, in two series of digestion trials with about five cows, each on high- and low-fat rations, differences in the digestibility of nutrients were not significant except for fat, which was 66.6 percent digested on high-fat rations as contrasted with 46.1 percent on the low-fat ration. In this comparison the rations consisted of barley, oats, wheat bran, molasses, beet pulp, bonemeal, salt, cottonseed meal, linseed meal, soybean meal, and corn distillers' dried grains with timothy hay. In the low-fat rations the oil meals and corn distillers' dried grains were solvent extracted, whereas in the high-fat rations the expeller or hydraulic method was employed. The digestibility of soybean products and combinations of them with soybean oil and corn oil was ascertained in the second series. The ether extract from various soybean products in the high-fat rations was significantly more digestible than the ether extract of the rations containing ground soybeans. With soybean products as the sole concentrates the crude fiber and N-free extract of rations containing soybeans and solvent-extracted soybean meal plus corn oil or fatty acids were more digestible than the ether extract of rations containing ground soybeans. The ration containing ground soybeans caused a marked increase in fat percentage, with practically no change in milk flow. Rations containing either oil or fatty acids caused a decrease in milk flow, with little or no change in fat percentage. The production of milk fat and fat-corrected milk bore no consistent relation to the intake of ether extract or total digestible nutrients. The soybean products used in connection with the studies included partially

heated soybean meal, toasted soybean meal, ground soybeans, toasted soybean meal plus oil, and toasted soybean meal plus soybean fatty acids.

Studies on ketosis in dairy cattle.—V, The development of ketosis, J. C. SHAW. ([Conn.] Storrs Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 12, pp. 1079–1090, illus. 9*).—In continuation of this series (E. S. R., 87, p. 568), blood glucose and acetone bodies were ascertained before and after parturition, by methods described in previous studies (E. S. R., 88, p. 672), in several cows from a herd that developed a considerable amount of ketosis. Prior to parturition the blood glucose values were normal, but hypoglycemia and ketonemia began to develop in 1–3 days after parturition. The liver was evidently depleted of glucose in ketosis, and the liver glycogen was low prior to parturition and the onset of ketosis. Added glucose was removed from the blood of cows with ketosis as rapidly as from normals. The mammary gland continues to remove a normal quantity of glucose from the blood even in marked hypoglycemia. The onset of ketosis was not prevented by high energy intake.

How fast can dairy cattle populations be increased? J. R. DAWSON and R. R. GRAVES. (U. S. D. A.). (*Guernsey Breeders' Jour., 65 (1944), No. 6, pp. 462, 469–470*).—Assuming that (1) one-half of the calves would be females with a breeding efficiency of 85 percent, there would be no culling, and 78 percent of the heifer calves would live, breed, and enter the milking herd as 2-year-olds; (2) the yearly mortality of cows in the milking herd would be 12 percent; and (3) 15.6 percent of the cows in the herd would be removed for disease, etc., such a herd with no heifers on hand would require approximately 9 yr. to double in size. The time of doubling would be shortened if heifers were in the herd at the start.

Reestablishment of the arterial supply to the udder, D. ESPE and C. Y. CANNON. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 9, p. 841*).—Ligation of the right external pudic artery of a month-old heifer calf was not reestablished after two lactations, but the arterial supply to the right half of the udder came exclusively from the caudal branch of the left mammary artery through an anastomosis of the blood vessels. There was no appreciable difference in the milk produced by the two halves of the udder. A successful mammary gland transplant was described as made in another month-old heifer.

The oxidation of vitamin A and carotene in milk fat, V. N. KRUKOVSKY, G. H. ELLIS, and W. R. PERCY. (Cornell Univ. and U. S. D. A.). (*Jour. Dairy Sci., 26 (1943), No. 9, pp. 869–875, illus. 3*).—The destruction of carotene in milk fat in the presence or absence of light was accompanied by the oxidation of the double bonds of unsaturated fats. A relationship exists between the intensities and order of appearance of oily, tallowy, and bitter flavors on one hand and the magnitude of observed chemical changes on the other. An additional photochemical unimolecular reaction caused the rapid destruction of vitamin A. It appears that the efficiency of utilization of vitamin A and carotene from the milk fat by a human being might be influenced by the ability of the fat to resist oxidation during its passage through the digestive tract. The rates of destruction of vitamin A and carotene in milk fat stored at different temperatures, irradiation, and pasteurization to prevent lipolysis were investigated.

A study of the blood carotene in relation to lipolytic activity of milk, N. P. TARASSUK and W. M. REGAN. (Univ. Calif.). (*Jour. Dairy Sci., 26 (1943), No. 11, pp. 987–996, illus. 6*).—In a study of the relation of the carotene content of the ration to the development of spontaneous rancidity in the milk fat, a very low carotene ration of bleached alfalfa hay and concentrates was found to deplete the carotene in the blood and milk fat very rapidly during the first 20 days. The carotene content of both leveled off after 40 days at values between 0.25 and 0.05

mg. per 100 cc. of blood plasma. Additions of 250 mg. of crystalline carotene per day only slightly increased the blood carotene, but 500 mg. markedly increased the blood carotene level. When 1,000 mg. of carotene or green alfalfa was fed, the carotene in the blood was rapidly repleted. Lipolysis of fat in aged milk, measured by surface tension of the milk and acidity of the fat, failed to reveal any consistent relation between the level of carotene in the blood or the milk fat of a cow and the extent of spontaneously developed hydrolytic rancidity. Every cow tested in a late stage of lactation and gestation on the ration of bleached alfalfa hay and concentrates secreted milk that spontaneously developed strong rancid flavor. The ingestion of the green alfalfa semed to prevent the secretion of milk high in a naturally active lipase and generally improved the flavor of the milk. Evidently the factor in green feed preventing spontaneous lipolysis of the milk fat is not its high carotene content, and the rancidity of the milk appearing near the end of gestation on dry feed cannot be attributed to low carotene content of the ration. The level of carotene in the blood and milk was not the important factor for or against the development of rancidity. The study was conducted with six cows kept for various periods up to 269 days on the experimental rations.

Ascorbic acid content of cow's milk during four successive lactation periods, A. D. Holmes, F. Tripp, E. A. Woelffer, and G. H. Satterfield (*Food Res., 8 (1943), No. 3, pp. 237–242, illus. 1*).—The ability of a Guernsey cow to produce ascorbic acid in the milk did not seem to diminish with successive lactations. The total daily ascorbic acid production averaged 214, 372, 239, and 432 mg. during the third, fourth, fifth, and six lactation periods, respectively. The cow was 11 yr. old after the sixth lactation.

Homogenizing efficiency test studies, H. F. Judkins (*Jour. Dairy Sci., 26 (1943), No. 11, pp. 997–1010*).—A study was made of the top and bottom samples of milk in 6,405 individual tests of milk homogenized in 52 plants. From these results it appeared that the United States Public Health Service test of homogenization, allowing only 5 percent difference in fat percentage between the top and bottom of 100 cc. of milk in a quart bottle, could be complied with but it was considered too stringent. Differences in readings of individuals, temperature of storage, fat content of milk, method of removing the sample, glass and paper bottles, homogenization pressure, and homogenization and pasteurization temperatures, all contributed to the effects of homogenization of the milk.

The effect of high-temperature-short-time heating of concentrated milk upon its heat stability, B. H. Webb and R. W. Bell. (U. S. D. A.). (*Jour. Dairy Sci., 26 (1943), No. 12, pp. 1071–1077, illus. 4*).—The heat stabilities of concentrated milks were increased by high-temperature-short-time heating. Milk forewarmed to 95° C. for 10 min. before concentration to 26 percent solids attained a maximum heat stability, measured by coagulation time, when heated to 150° with no holding. The heat stability of concentrated milk was markedly increased when the raw milk had been forewarmed to either 65° or 95°. Heating skim milk of 18.5 percent solids to 135°–145° caused a lessening of its heat stability. Because of the effects of heat treatment on body and color of the evaporated milk, heat stability alone cannot be considered. Methods used were the same as those described in the previous investigation (E. S. R., 90, p. 91).

The incidence of oxidized flavor in the milk of individual cows within one herd, W. J. Corbett and P. H. Tracy. (*Univ. Ill.*) *Jour. Dairy Sci., 26 (1943), No. 12, pp. 1095–1106*).—Samples of milk (538) were collected from 138 cows in the university herd at monthly intervals from March through July and September and pasteurized. One p. p. m. of copper was added to one-half of them, and they were stored for 1 and 3 days; oxidized flavors developed in 1.48 and 10.01 percent of the samples without copper and 78.5 and 91.7 percent with copper after the two periods of storage, respectively. The study was made of the rela-

tion of oxidized flavor development to breed and age of cows, period of lactation, and yield of milk and fat. Stage of lactation was the most significant factor regarding the occurrence and extent of oxidized flavor. There seemed to be a greater tendency for its development when the copper was added, and there was greater development in milk produced during the first or second month than during the latter part of lactation, both in pure samples and in samples to which copper was added. There was little difference between the milk of the several breeds and the milk and fat yield in the development of oxidized flavor. Additions of certain antioxidant substances, such as tyrosine, hydroquinone, ascorbic acid, and cereal grains, retarded or even prevented the development of the unfavorable conditions. Evidently individual cows varied in their tendency to produce milk that developed flavor. Milk from heifers early in lactation was especially susceptible.

Twenty-ninth annual report of the creamery license division, T. H. Binney (*Indiana Sta. Cir. 292 (1943), pp. 15*).—Data are presented on testers' licenses and glassware inspection for the year ended March 31, 1943 (E. S. R., 89, p. 357).

The relationship of the score of butter to the mold mycelia grade, J. C. Boyd and J. A. Nelson. (Mont. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 12, pp. 1091–1093*).—This relationship (E. S. R., 89, p. 724) was ascertained in 280 commercial samples ranging from 93 to 87 as scored by two experienced judges. Of the samples graded for mycelia, 261 were satisfactory and 4 were unsatisfactory or very unsatisfactory. Butter scoring 90 or above was relatively free of mold mycelia provided it was not made from a mixture of high-grade and low-grade cream.

Cheese yields: A summary of available information, D. D. Brubaker (*U. S. Dept. Agr., Farm Credit Admin., Spec. Rpt. 124 (1943), pp. 13+, illus. 2*).—Estimates of the yields of Cheddar cheese from standardized and unstandardized milk are presented, based on different fat percentages.

Pasteurizing milk for cheese making by direct steam, J. C. Marquardt and M. W. Yale (*New York State Sta. Tech. Bul. 271 (1943), pp. 13, illus. 3*).—Water dilution by pasteurizing milk for cheese making by heating from 50° to 160° F. by direct steam with special equipment was less than 20 percent. A dilution of 10 percent or less did not seriously affect the curd strength, but above this dilution reductions in strength of curd and setting rates were corrected by culture additions and incubation periods. Chemical analyses showed that the volatile fatty acid and water-soluble N changes in the cheese as a result of the direct steam pasteurization of the milk were equal to those in cheese from regularly pasteurized milk. The cheese was of excellent quality, and it seems practical to employ the equipment described for pasteurizing milk for cheese making.

Coliform bacteria in Cheddar cheese, M. W. Yale and J. C. Marquardt (*New York State Sta. Tech. Bul. 270 (1943), pp. 27, illus. 3*).—Coliform counts of 35 lots of Cheddar cheese were made at various intervals from setting the milk to 12 months' curing and storage of the cheese at 50° F. Of 6 lots of the cheese made from poor quality raw milk, the maximum coliform counts ranged from 9,900,000 to 410,000,000 per gram, and the coliform organisms survived for 6–12 mo. The better quality milk contained fewer coliform organisms and these survived for 3–6 mo. Although the pasteurized milk used in cheese manufacture contained less than 1 coliform organism per cubic centimeter, the cheese curd had counts of 900–57,000 coliform organisms per gram due to recontamination and growth even though special precautions were taken. Coliform counts were not a reliable index for comparing the quality of different lots of cheese, because the organisms grew and died at such variable rates in the different lots. The rate and extent of acid development, manufacturing and cooking temperatures,

and the rate and time of salting controlled growth of the coliform organisms. Gas holes developed when the coliform count exceeded 10,000,000 per gram. The growth of coliform organisms was greatly inhibited by an acid development of pH 5.0 or less and the cheese showed acid defects. Additions of 1 percent salt to milk stimulated growth of coliform bacteria and acid development, but 2 percent salt inhibited growth. Between 8 and 9 percent salt was tolerated in broth.

Agitation and temperature of cheese milk and the development of rancid and unclean flavors in Cheddar cheese, I. HLYNKA, E. G. HOOD, and C. A. GIBSON (*Jour. Dairy Sci., 26 (1943), No. 12, pp. 1111–1119*).—Rancid and unclean flavors in Cheddar cheese have been shown to be fundamentally related and caused by milk lipase. The lipase was activated by vigorous agitation, especially of uncooled cheese milk. Study was made of the flavor of cheese made from milk held at different temperatures and churned for 3–15 min. Minimum agitation and cooling of cheese milk are recommended to improve the quality of Cheddar cheese flavor. All grading was done by a thoroughly trained commercial grader.

The bacteriology of brick cheese.—IV, Control of "early-gas" defect, J. C. GAREY, E. M. FOSTER, and W. C. FRAZIER. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 9, pp. 833–839, illus. 3*).—Continuing these studies of brick cheese manufacture (E. S. R., 87, p. 708), the early gas defect made by the "mild wash" method from raw milk inoculated with 0.0025 percent of *Aerobacter aerogenes* was prevented by a combination of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* starters and a cooking temperature of 112° or 120° F. The quality of such cheese was equal to that of control cheese after 5 weeks. The gas formation was not prevented by the use of thermophilic streptococcus starters and heating to 106°. The lag phase of the growth of *A. aerogenes* was prolonged several hours when the temperature was raised above 106° . Therefore, a starter would have to be used which would ferment all the lactose before the *A. aerogenes* organisms recovered from the "heat shock" effect. Growth of *A. aerogenes* in milk previous to its use in cheese was likely to cause flavor defects.

Use of whey solids in ice cream and sherbets, A. LEIGHTON. (U. S. D. A.). (*Ice Cream Rev., 27 (1944), No. 6, pp. 18–19, 58–59, illus. 2*).—Whey solids could advantageously be used in wartime ice cream by replacing 1–3 percent of the solids in mixes containing 8–14 percent butterfat. The quality of the products was judged by a group, and the body and texture of the ice cream were generally improved by the whey solids additions. Curdling did not occur if the mixes were pasteurized immediately or if the whey powder was dissolved in hot water. Pasteurization of liquid whey inactivates the rennin. The low milk-solids-not-fat content of sherbets makes unnecessary any danger from lactose crystallization.

Sweetening power of the corn sugars in ice cream, A. LEIGHTON and O. E. WILLIAMS. (U. S. D. A.). (*Jour. Dairy Sci., 26 (1943) No. 12, pp. 1107–1110*).—A study in which from one-third to one-half of the cane sugar in ice cream was replaced by corn sugars was made to ascertain the sweetness of vanilla and chocolate ice creams. The comparative sweetness of two vanilla creams, one containing 15 percent cane sugar and the other 10 percent cane sugar and 5 percent dextrose was determined by a jury of 10. The results indicated that the dextrose-containing ice cream was sweeter than that containing only the cane sugar. Confirmation of these results was obtained when samples containing 13 percent cane sugar were compared with those containing 8.66 percent cane sugar and 4.33 percent corn sugar. In another series of experiments with vanilla and chocolate ice creams it was concluded that dextrose monohydrate in frozen ice cream in the presence of cane sugar is one-fifth again as sweet as cane sugar. In similar experiments, sweetness values of 60 for corn sirup solids and 75 for

the solids of enzyme-converted corn sirup were obtained with cane sugar as 100. It appears evident that a mixture of 1 part corn sirup solids and 2 parts dextrose may have the effective sweetness in ice cream of an equal weight of sucrose when it is substituted in amounts up to one-half the sucrose normally used.

VETERINARY MEDICINE

Dissection guide for veterinary anatomy, J. D. Grossman (*Ann Arbor, Mich.: Edwards Bros., 1944, 4. ed., pp. 52+, illws. 8*).—This is primarily a student's manual, including both upright and ventral dissection.

War and postwar disease control problems, H. W. Schoening. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 804, pp. 129–132*).—An address in which the desirability of coordinated research is emphasized.

Recent developments of public health significance in some diseases of domestic animals, M. M. Kaplan (*Vet. Med., 39 (1944), No. 5, pp. 197–203, illus. 8*).—This is a discussion of the status of knowledge on diseases transmissible from animals to man, including rabies, leptospirosis, tularemia, equine encephalomyelitis, salmonelloses, swine erysipelas, Rocky Mountain spotted fever, staphylococcosis, psittacosis, and brucellosis.

[Contributions on miscellaneous diseases] (*Ztschr. Immunitätsf. u. Expt. Ther., 103 (1943), No. 1, pp. 80, illus. 5*).—This number contains the following contributions: Ueber die Trichinose und ihren Nachweis, unter besonderer Berücksichtigung der immunbiologischen Verfahren [Trichinoses and Their Demonstration Under the Special Conditions of Immunobiological Treatment], by J. Kathe and F. Peters (pp. 1–25); Ueber einfache Trocknung von Testbakterien für Agglutinationszwecke [A Simple Method of Desiccation of Test Bacteria for Agglutination Purposes], by W. Steuer (pp. 26–34); Zur Epidemiologie und Immunbiologie der Leptospirosen, mit besonderer Berücksichtigung des Schlamm-Feldfiebers [The Epidemiology and Immunobiology of the Leptospiroses, With Special Reference to Those of the Marsh Fevers], by P. Uhlenhuth (pp. 35–59); Infektionen mit *Leptospira grippo-typhosa* bei Tieren und ihre Bedeutung für die Epidemiologie des Schlamm-Feldfiebers [Infection With *L. grippo-typhosa* of Animals and Its Significance in the Epidemiology of the Marsh Fevers], by J. Kathe (pp. 60–77); and Die Steigerung der Pathogenität der Streptokokken durch H-Vitamin [The Increase of Pathogenicity of the Streptococci by the H Vitamin], by A. Illényi (pp. 78–80).

Chemo-therapy in acute febrile conditions of animals—case reports, H. W. Herriott et al. (*Pa. Univ., Vet. Ext. Quart. No. 93 (1944), pp. 3–10*).—In clinical studies conducted by a number of veterinary practitioners sulfathiazole sodium sesquihydrate administered intravenously, followed by sulfathiazole per orum, proved effective in the treatment of shipping fever of cattle and horses and in a mixed infection in dogs. Experience has shown that recently infected cases respond better than cases of long standing. In many instances supplemental treatment is indicated.

Preparation and standardization of johnin purified protein derivative, C. W. McIntosh and H. Konst (*Canad. Jour. Pub. Health, 34 (1943), No. 12, pp. 557–563, illus. 1*).—In the preparation of johnin an attempt was made to remove the factors responsible for nonspecific reactions in previous processes while retaining the specific substances. This was accomplished by ultrafiltration as in the production of tuberculin purified protein derivative (P. P. D.). The yield of johnin P. P. D. was found to be greater when the pH of the medium was changed from an acid to an alkaline reaction previous to harvesting. A high and fairly constant degree of sensitization to johnin was obtained in guinea

pigs by intraperitoneal injection of Ca salts 48 hr. prior to the application of the sensitizing dose of *Mycobacterium paratuberculosis* by the same route. Johnin P. P. D. preparations obtained by identical methods varied considerably in potency, but by biological assay on sensitized guinea pigs the variation of different lots could be detected with a reasonable degree of accuracy.

Bacterins: Preparations, use, and misuse, H. J. Stafseth (*M. S. C.* [*Mich. State Col.*] *Vet., 4 (1943), No. 1, pp. 12–15, 48, 50*).—Methods of preparing and standardizing autogenous bacterins are discussed, with notes on the use and misuse of bacterins and the curative bacterin treatment.

The mode of action of sulfonamides, R. J. Henry (*Bact. Rev., 7 (1943), No. 4, pp. 175–262, illus. 1*).—This comprehensive review includes a bibliography of 291 titles.

The pharmacologic basis for the widely varying toxicity of arsenicals, R. B. Hogan and H. Eagle (*Jour. Pharmacol. and Expt. Ther., 80 (1944), No. 1, pp. 93–113, illus. 7*).—It is suggested that the varying systemic toxicity of arsenicals is primarily determined by the varying degree to which they are bound by, and thus block, essential functional groups in vital organs. The chemical nature of these groups is discussed.

An apparatus for the safe inoculation of animals with dangerous pathogens, M. van den Ende (*Jour. Hyg. [London], 43 (1943), No. 3, pp. 189–195, illus. 5*).—An inoculation box is described which is designed to prevent the distribution of infective droplets into the air of the laboratory during the intranasal inoculation of mice with dangerous pathogens. Tests of its efficiency are included, as is an appendix by A. J. G. Hubbard.

Brucella allergy in veterinarians, I. F. Huddleson. (Mich. Expt. Sta.). (*M. S. C.* [*Mich. State Col.*] *Vet., 4 (1943), No. 1, pp. 10–11, 45*).—Reactions found in several groups of veterinarians are described.

Direct microscopical observations upon the rumen population of the ox.—I, Qualitative characteristics of the rumen population, F. Baker (*Ann. Appl. Biol., 30 (1943), No. 3, pp. 230–239*).—The rumen contents examined were obtained either from local slaughterhouse material or from a fistula animal.

The author reports that the rumen population of the ox comprises three major groups of micro-organisms: (1) Protozoa, (2) iodophile micro-organisms, and (3) aniodophile micro-organisms. The iodophile species comprise macro and micro forms. The forms include several new species and genera, which are described. A fixed and a free iodophile population are discriminated, the former constantly attached to starch grains and vegetable fragments, the latter in suspension in the rumen liquid. The rumen population was qualitatively independent of the range of diet and of the breed of animal examined. Protozoa play no part in the decomposition of cellulose but digest starch. Decomposition of both starch and cellulose is accomplished by the fixed iodophile microflora which, in the process, synthesize iodophile polysaccharide. During passage through the alimentary canal the rumen population is eliminated, the Protozoa by peptic and tryptic digestion and the iodophile microflora by (1) digestion by Protozoa, (2) autolysis, and (3) action of digestive enzymes. The products of microbial synthesis are held to be assimilated by the host animal.

He concludes that it is clear that "the microbial population of the rumen is persistent and stable, and that its broad qualitative features are independent of the breed of the animal, the locality of the herd or, in the examples instanced, the nature of the diet."

Diseases of feeder cattle in Kansas, H. Farley (*Kansas Sta. Cir. 220 (1944), pp. 16*).—This is a revision of Circular 214 (E. S. R., 88, p. 678), adding data as to anaplasmosis (yellow teat disease) and actinomycosis or lumpy jaw.

Om värdet av serologiska mjölkundersökningar medelst "ABR"

(Abortus Bang Ringprobe) (On the value of serological investigation of milk according to "ABR" (Abortus Bang Ringprobe), N. O. Norell and Å. Olson (*Skand. Vet. Tidskr., 33 (1943), No. 6, pp. 321–341; Eng. abs., pp. 339–341*).—The authors carried out comparative serological investigations of several thousand milk samples, using the slow agglutination method, the Schönberg-Imig method, and the method termed ABR. For the preparation of antigen for ABR the authors employed abortus bacilli which had been killed by boiling. To the antigen there was added as a conserving liquid a 0.5 percent solution of carbolglycerine (0.5 percent phenol). The ABR was read off after 15 and 50 min. The authors emphasize the difficulty of judging reactions when employing the Schönberg-Imig method. The advantages claimed for ABR are speed, simplicity, and ease. The method is recommended partly as an orientation method where it is necessary to gain speedily an idea of the spread of the disease and partly as a controlling factor in districts where the disease does not occur.

Brucellosis of cattle, V. K. McMahan (*Kansas Sta. Cir. 222 (1944), pp. 16*).—This circular consists of a discussion of the disease in an endeavor to answer some of the questions asked by farmers and stockmen.

Handbook for the etiology, diagnosis, and control of infectious bovine mastitis, I. A. Merchant and R. A. Packer (*Minneapolis, Minn.: Burgess Pub. Co., 1944, pp. 66+*).—This handbook has been prepared largely for the student but is regarded as of value also to the practicing veterinarian.

The effect of incomplete milking on chronic mastitis caused by Streptococcus agalactiae, O. W. Schalm and S. W. Mead. (Univ. Calif.). (*Jour. Dairy Sci., 26 (1943), No. 9, pp. 823–832, illus. 2*).—The effect of incomplete milking was studied with infected cows that were producing a visibly normal secretion at the time they were placed on experiment.

Five cows having eight quarters infected with *S. agalactiae*, five quarters shedding staphylococci, and seven quarters free of any infection were selected for the first trial on incomplete milking. An attempt was made to leave about 2 lb. of milk in the udder of each cow at every milking over a 13-week period. Under this system the noninfected quarters continued to produce a normal milk, four of the five quarters shedding staphylococci infrequently showed visible particles in their foremilk, while every quarter harboring *S. agalactiae* developed readily visible symptoms of mastitis. The strip-cup test became positive with two *S. agalactiae*-infected quarters during the first week of incomplete milking, with four such quarters during the second week, one infected quarter during the third week, and another during the fifth week. With seven of the eight infected quarters, flakes, clots, shreds, and sometimes thick pus were found in the foremilk with great regularity as long as incomplete milking was continued. Two quarters developed acute mastitis, and their parenchyma, as well as that of another quarter, increased in firmness. The chlorine content and the cell count of the *S. agalactiae*-infected milk increased significantly as soon as the incomplete milking was started, whereas no appreciable changes were observed in the secretion of the normal quarters. The total bacterial count of both normal and infected milk was not affected to any great extent. When thorough milking was resumed there was a definite tendency toward a return to a visibly normal secretion, although with three quarters production was considerably reduced and the milk was somewhat watery.

In a second test, two cows with noninfected udders and four cows having a total of six quarters infected with *S. agalactiae*, six quarters shedding staphylococci, and four quarters free of any infection were not stripped after normal machine-milking over a period of 17 weeks, except after two evening milkings each week to ascertain the quantity of milk left in the udders. The average amount of strippings per udder varied from 0.52 to 1.1 lb. per milking, and

the average quantity retained by the individual quarters per milking varied from 0.03 to 0.4 lb. The noninfected quarters continued to produce a normal secretion, four of the six quarters shedding staphylococci infrequently contained visible particles in their foremilk, and the quarters harboring *S. agalactiae* reacted in a variable manner to nonstripping. Among the *S. agalactiae*-infected quarters, the two retaining the smallest average quantity of strippings, 0.05 and 0.10 lb. of milk per milking, developed the most pronounced clinical symptoms of mastitis, while quarters retaining from 0.2 to 0.4 lb. of milk per milking only infrequently showed mild evidence of mastitis. In every case, however, the inflammatory process in the *S. agalactiae* quarters was aggravated to some degree, as indicated by a significant rise in cell count when nonstripping was practiced. The chlorine content and the bacterial count of both normal and infected milks were not affected materially.

Tyrothricin in the treatment of bovine pyometritis, C. F. Clark (*M. S. C. [Mich. State Col.] Vet., 3 (1943), No. 4, pp. 133, 153–155*).—Details of two cases treated with this product are reported.

Dermatosis of the ears, cheeks, neck, and shoulders in young calves, C. L. Cole, R. A. Rasmussen, and F. Thorp, Jr. (Mich. Expt. Sta.). (*Vet. Med., 39 (1944), No. 5, pp. 204–206*).—Study of an eczematoid disease occurring in young calves indicated an intimate connection with ascorbic acid. When four calves were given an initial subcutaneous injection of 3 gm. of ascorbic acid, there resulted an ultimate rise in blood plasma ascorbic acid and a corresponding improvement in the dermatosis.

Sheep parasites, P. A. Hawkins (*M. S. C. [Mich. State Col.] Vet., 3 (1943), No. 4, pp. 140–142, 152, illus. 1*).—This deals largely with the administration of phenothiazine and of work on ovine coccidiosis.

Further studies on the control of lung worms in sheep, D. F. and M. W. Eveleth. (Ark. Expt. Sta.). (*M. S. C. [Mich. State Col.] Vet., 4 (1943), No. 1, pp. 22–25, 46, illus. 2*).—On further work (E. S. R., 88, p. 821), critical studies were undertaken to determine the maximum length of time that naturally infected lambs would disseminate lungworm larvae when the lambs were maintained on concrete floors and all chances of reinfection eliminated. In several instances the lambs ceased to eliminate lungworm larvae after varying lengths of time up to 127 days. A tentative plan of control, based on intratracheal injections and feeding of phenothiazine, is outlined.

Traitement des strongyloses ovines, V. Viscontini (*Gouvt. Gén. Algérie, Dir. Écon. Algérienne, Bul. 90 [1943], pp. 23+*).—Special attention is given to gastrointestinal and pulmonary strongyloses. Their prevalence in Algeria, native knowledge concerning them, means of infestation, symptoms, lesions, and treatment are briefly considered.

Keeping range lambs free from intestinal worm (*Montana Sta. War Cir. 5 (1943), pp. [4]*).—Recommendations for the prevention and treatment of intestinal parasites in range ewes and lambs are presented.

Prevention of losses from coccidiosis (scours) in feed lot lambs (*Montana Sta. War Cir. 4 [1944], pp. [3]*).—Experiments carried on in 1941 and 1942 are briefly referred to which "seem to prove the theory developed from observations in many feed lots that shipping conditions and methods of starting on feed are important factors leading to the development of coccidiosis. The results in the experimental lots, as well as the experience of feeders, indicate that serious loss from this disease can be prevented by (1) buying good quality, well-developed lambs; (2) careful handling from the range to the feed lot; [and] (3) starting the lambs on grass pasture or on wild hay and gradually changing to alfalfa and beet products."

Control of pulpy kidney disease (entero-toxemia) of lambs, O. H. Muth. (Oreg. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 804, pp. 144–147*).—Continuing the work reported by Shaw et al. (E. S. R., 82, p. 683), antiserum was prepared by hyperimmunization of horses with toxin from cultures of *Clostridium perfringens*, type D, isolated from lambs dead of pulpy kidney disease. Reports from owners in 1942, when over 3,000 lambs were treated in one county, indicated that this serum has proved efficient in controlling outbreaks.

Swine brucellosis, S. H. McNutt and T. S. Leith. (Iowa State Col.). (*M. S. C. [Mich. State Col.] Vet., 4 (1943), No. 1, pp. 28–34, 50*).—Brucellosis of swine, defined as the disease of this species caused by *Brucella suis*, is discussed largely on the basis of the authors' experience.

The effect of diet, chilling, and gastrointestinal irritation on susceptibility to infection with S. suipestifer, R. Gwatkin and I. W. Moynihan (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 3, pp. 66–79*).—Four experiments are reported as carried on to determine whether diet had any influence on susceptibility to infection. In all four experiments the cultures produced transitory results of a toxic nature, but *S[almonella] suipestifer* did not become established in any of the exposed animals. Diet, within the range employed, apparently did not affect the susceptibility of the animals to infection. Chilling and the production of gastrointestinal irritation by chemical means likewise failed to render the animals susceptible to infection with the strains employed.

An unusual epizootic of tetanus in young pigs, M. M. Kaplan (*Middlesex Vet., 3 (1943), No. 1, pp. 8–11, illus. 3*).—An outbreak in Revere, Mass., which resulted in a loss of approximately 60 pigs, or 10 percent of the number farrowed, is described.

An unusual type of anthrax in horses and mules, R. McNellis ([*U. S.*] *Off. Surg. Gen., U. S. Army Med. Dept. Bul. 71 (1943), pp. 84–86*).—Four cases encountered in Peru, in which the spleen remained normal, are cited to emphasize the necessity of laboratory examination for the diagnosis of anthrax. In all cases an acute type of anthrax was revealed similar to that seen in hogs and possibly contracted from a pasture contaminated years before by hogs.

Malignant lymphoid tumors in horses, R. A. Runnells and E. A. Benbrook. (Iowa State Col.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 804, pp. 148–150*).—Six cases are discussed, including two in which there was widespread metastasis. In one horse the lesions resembled Hodgkin's disease in man.

Några iakttagelser i samband med sulfonamidterapi hos hund (Some observations in connection with sulfonamide therapy for the dog), I. Alström (*Skand. Vet. Tidskr., 33 (1943), No. 6, pp. 357–367, illus. 1; Eng. abs., pp. 366–367*).—The author has shown that, if para-aminobenzoic acid and sulfonamide are administered to the dog at the same time, the sulfonamide appears in the blood partly in coupled form. This is not the case if the sulfonamide is given alone. If para-aminobenzoic acid and sulfapyridine are simultaneously added to a substratum where a chemoresistant streptococci strain is being cultivated, a coupling of the sulfapyridine begins. If the same chemoresistant streptococci strain be cultivated in a substratum containing sulfanilamide, the sulfanilamide is transferred partly in coupled form without the addition of any para-aminobenzoic acid. This is not the case with sulfapyridine and sulfathiazole. "The ability of para-aminobenzoic acid to transfer sulfonamide derivates in coupled form is probably a property specific to the acid in question. Benzoic acid, for instance, does not possess this ability."

Dilatation of the small intestine of the fowl, J. D. W. A. Coles (*Jour. So. African Vet. Med. Assoc., 14 (1943), No. 3, pp. 94–98*).—A form of intestinal

dilatation which seems to have escaped attention is described as noted in 39 cases in a pedigreed flock in Onderstepoort. Marked emaciation and poor egg production are usually characteristic of the disease, which is essentially one of middle life. Post mortem reveals a sausage-shaped dilatation in the central portion of the small intestine, usually from 2 to 2.5 cm. in diameter and as much as 25 cm. in length. While the etiology has not been elucidated, the evidence suggests that the cock may play an important role in the transmission of a predisposition to the disease.

Emergency poultry disease prevention, H. J. STAFSETH. (Mich. State Col.). (*Vet. Med., 39 (1944), No. 5, pp. 207–212, illus. 6*).—This is a discussion of conditions pertaining to fowl cholera and fowl typhoid, pullorum disease, avian tuberculosis, laryngotracheitis, the leucosis complex, intestinal worms, fowl pox, coccidiosis, diseases of undetermined or complicated etiology, and disinfectants and remedies.

Agencies to contact in case of poultry troubles attributed to feed, disease, or management (*Oklahoma Sta. [Mimeog.] Cir. 103 (1943), pp. 4+*).—Suggestions are offered to facilitate the mailing of letters of inquiry and the forwarding of specimens and samples to the proper authorities. A report blank for use is appended.

Nasal histopathology and liver storage in subtotal vitamin A deficiency of chickens, E. JUNGHERR ([*Connecticut*] *Storrs Sta. Bul. 250 (1943), pp. 36, illus. 23*).—Continuing a preliminary account (E. S. R., 84, p. 510), this investigation was concerned with the application of histopathologic methods to the recognition of subtotal vitamin A deficiencies in chickens for purposes of diagnosis, assay, and comparison with other methods of estimating vitamin A requirement. Five consecutive experiments were conducted with "special stock" Single Comb White Leghorn chicks receiving a basal diet and supplements of from 25 to 1,200 (in steps of 25 to 200) International Units (I. U.) of vitamin A per head per day (p. h. p. d.) in sevenfold doses once each week. Individual weight records were obtained at weekly intervals. The supplements consisted of U. S. P. "Reference" cod-liver oil and of commercial standardized cod-liver oil, usually fed in parallel series, and, in the last experiment, of commercial cod-liver oil and carotene in oil. In the last three experiments the livers were subjected to photometric analysis for vitamin A. The five experiments involved a total of 374 birds, of which 32 were controls on commercial diets. Various tissues from representative birds were subjected to histopathologic analysis. About 6 transverse sections were made of the nasal structures of 290 birds, a total of 1,759 nasal sections.

Histopathologic examinations showed that the lesions in subtotal vitamin A deficiencies resembled in character, but not in severity, those described by Seifried (E. S. R., 64, p. 774) for total vitamin A deficiency in the chicken. The nasal structures proved to be the most sensitive indicator of borderline deficiencies and were therefore made the basis of the routine histopathologic analysis.

The microscopic anatomy of the nasal passages of normal chicks was studied, 602 serial transverse sections of normal and experimental birds that had received a known sufficiency of vitamin A being examined. The entire nasal vestibule was found to be lined with a modified squamous epithelium, and the main nasal cavity with respiratory epithelium. The extent of the olfactory epithelium was defined. Specific nasal lesions occurred on the mucoid side of the mucocutaneous junctions, especially in the region of the septum, anterior turbinate, and palatine cleft. With increasing doses of vitamin A there was a noticeable caudorostral recession of the lesions. The average severity of the lesions was inversely related to the vitamin A intake. Some variations in location and severity of lesions were noted in individual birds on the same vitamin intake. Uncompli-

cated lesions resulting from feeding subminimal doses of vitamin A permitted recognition of the basic character of the specific lesion. In young chicks specific lesions were detectable sometimes after 14 days and always after 21 days on severely deficient diets.

Inflammatory lesions as evidence of infection were found to occur in the nasal passages of 42 of 290 birds, independent of vitamin A intake. Pseudolesions and malformations were observed occasionally, but were relatively rare in young birds, "a fact which supports the use of chicks for experimental purposes."

The smallest dose of vitamin A capable of keeping the nasal tissues intact was looked upon as the minimum physiologic requirement. Under the conditions of the present experiments, 250 to 350 I. U. p. h. p. d. of vitamin A appeared to constitute the minimum requirement for chicks up to 8 weeks, in contrast with estimates reported in the literature, namely, 23 to 370 I. U., with the majority below 100 I. U. Seven and a half-month-old birds were protected by 400 I. U. p. h. p. d., which was in close agreement with about 421 I. U., suggested as the practical minimum requirement (minus a 19-percent safety factor) of adult birds by Almquist and Mecchi (E. S. R., 81, p. 410).

Observations on, and statistical analysis of, factors governing the physiology of vitamin A storage indicated (1) a direct relationship to vitamin A intake; (2) higher storage on comparable doses of vitamin A from cod-liver oil than from carotene in oil; (3) increasing storage capacity of chickens after the age of 2 mo.; and (4) a possible sex difference, young males storing less vitamin A than comparable females, but with the trend reversed in older birds.

It is concluded that "histopathologic examination of the nasal passages constitutes a delicate method for the recognition of subtotal vitamin A deficiency. The method can be utilized in estimating the minimum physiologic requirement of chickens for vitamin A. The advantages of the method are (1) a shortening of the experimental feeding period, (2) reduction of number of birds, and (3) a high degree of sensitivity. Disadvantages are the necessity of making three to four transverse microscopic sections after time-consuming decalcification, and the occasional occurrence of misleading nondiagnostic lesions. The histopathologic method appears to reflect more directly the physiologic minimum requirement for vitamin A than average growth records and liver storage."

A list of 66 references is appended.

The avian leukosis complex, K. L. Bullis. (Mass. State Col.). (*Northeast. Poultryman, 38 (1944), No. 3, pp. 5–6, 26–27*).—This review attempts to answer questions as to cause, transmission, inheritance, and incidence, with suggestions as to control.

Comparison of the tube and rapid serum agglutination tests for the detection of pullorum disease in turkeys, E. M. Dickinson, A. S. Rosenwald, and D. R. Morrill (*Oregon Sta. Tech. Bul. 6 (1944), pp. 7, illus. 2*).—A comparison of the rapid serum and tube agglutination tests for pullorum disease was conducted on 10,019 turkey blood samples. Of 678 positive reactions, 92.7 percent were positive to the tube method and 91.4 percent were positive to the rapid serum. Of the total diagnosed as positive, both tests were in agreement on 84.2 percent.

Spontaneous malaria in canaries, C. B. Hudson. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 804, p. 158*).—A number of cases in a flock in New Brunswick, N. J., are recorded.

AGRICULTURAL ENGINEERING

Water-table fluctuations in the Spokane Valley and contiguous area, Washington-Idaho, A. M. Piper and G. A. La Rocque, Jr. (*U. S. Geol. Survey, Water-Supply Paper 889–B (1944), pp. 83–139+, illus. 5*).—This report de-

scribes certain ground-water features of the valley plains along the Spokane and Little Spokane Rivers in Washington and of Rathdrum Prairie and contiguous extensive plains that extend northeastward to Lake Pend Oreille and the Pend Oreille River, in Bonner and Kootenai Counties, Idaho, and cover about 425 sq. miles, largely undrained. These plains, formed from glacial deposits at least 500 ft. thick at many places, are in large part extremely pervious to water. The deposits contain a large body of unconfined water, presumably derived from deep infiltration of rain and melted snow on the plains, percolation from certain of the lakes along the margins of the plains, and percolation from numerous creeks that discharge onto the plains. The underflow is, on the average, about 650,000,000 gal. a day. For all purposes, the average rate of withdrawal is estimated to be about 65,000,000 gal. a day.

The report includes and interprets in a preliminary manner about 12,000 measurements of water level in wells in the period ended with 1938, unique for the Pacific Northwest in that they afford continuous records covering 10 yr. or more for many of the observation wells.

[**Water resources survey**] (*U. S. Geol. Survey, Water Resources Rev. U. S. and Canada, 1944, Mar., pp. 6, illus. 1*).—Stream-flow data for March 1944 are presented for New England and the Maritime Provinces, for the South Atlantic and South Central States where stream flow was excessive, and for the West. Reference is also made to deficient water supplies in southern Florida and to floods in Indiana.

Water-application efficiencies in irrigation, O. W. Israelsen, W. D. Criddle, D. K. Fuhriman, and V. E. Hansen. (Coop. U. S. D. A.). (*Utah Sta. Bul. 311 (1944), pp. 55+, illus. 22*).—This bulletin reports the results of field studies of water-application efficiencies, in which efficiencies on 11 Utah County farms ranged from 24 to 51 percent, with an average of 40 percent. Efficiencies on 6 Salt Lake County farms ranged from 18 to 58 percent, with an average of 35 percent.

The dominant factors contributing to low water-application efficiencies on all farms in both counties were excessive applications of water, uneven distribution of water over the land, and excessive moisture content of the soil before irrigation, or a combination of these factors. In general, low water-application efficiencies usually result when: The land surface is irregular and water ponds in low places; the farm irrigation system and methods of water application are obsolete and unsuitable; the operator uses very large streams on small plats of low permeability or small streams and long irrigation runs on highly permeable soils; surface runoff losses are excessive as a result either of conditions beyond the control of the irrigator or of carelessness; the farmer irrigates while his soil is still quite moist; excessive volumes of water are applied in single irrigations; the supply of water is above normal rather than below; and when the farmer fails to control and distribute his irrigation water reasonably.

Irrigation of vegetables and berries in the home garden, L. J. Smith (*Wash. State Col. Ext. Cir. 60 (1943), pp. 4, illus. 1*).—When preparing the land it is advisable to attempt developing uniform slopes and eliminate high and low spots; to keep the land well cultivated to conserve moisture; not to allow the soil to get too dry before irrigating; not to overirrigate, but to use as much water as the soil will stand and irrigate less often; if the surface soil has become very dry, to irrigate lightly in order to secure satisfactory seed germination; to follow the irrigation as soon as possible with a shallow cultivation to conserve moisture; and to keep weeds down in order to prevent waste of soil moisture.

Engineering developments in soil and water conservation, T. B. Chambers. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 3, pp. 86–89, illus. 4*).—The

author outlines the basic requirements of the work of a conservation engineer and cites numerous examples for diverse and widely separated sections of the country to show the increases in production and the improvements in economy of costs and of labor effected, in addition to soil conservation, by conservation farming. Illustrative of the examples given is that of the Iowa Experiment Station comparison of 30 fields of corn and 30 of soybeans in adjacent areas of contour and of up-and-down-hill tillage in which 6.2 bu. of corn and 3.2 bu. of soybeans were gained by contouring; and the saving of the runoff from 550 acres of Tennessee pasture land in a system of 9 ponds from which water sufficient for the supplemental irrigation of 100 acres under vegetables were obtained. Observations made in Pennsylvania in the northeastern region of the Soil Conservation Service showed a reduction of nearly 50 percent in tractor power requirements to have been effected by operating on the contour.

Postwar plans for soil and water conservation, M. L. Nichols. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 3, p. 93*).—In the event of a possible period of unemployment incident to retooling for peacetime manufacturing, the author feels that planning now for projects in agricultural engineering is important, so that any necessary employment of large numbers of men by the Government can be directed toward "real needs and organized to avoid unnecessary expenditures or extravagance." Irrigation, drainage, flood control, and other soil and water conservation works are considered. From the viewpoint of such planning of specific projects for capital improvement, 21 are listed.

The machinery factor in soil conservation, T. S. Buie. (U. S. D. A.). (*Agr. Engin., 25 (1944) No. 3, pp. 79–82, illus. 3*).—This is a discussion devoted largely to indicating the importance of general farm machinery in carrying on a diversity of operations needed for effective conservational farming. To make the best use of soil and water resources so that each acre will produce the maximum of the crop it is best suited to produce, it is necessary to use many and varied agronomic and engineering measures.

Sweetpotato production: Mechanical equipment studies, J. W. Randolph and W. S. Anderson. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 392 (1943), pp. 96, illus. 81*).—Work on the design, adaptation, and use of equipment, from 1939 to 1943, indicated (in part) that:

Labor can be conserved and efficient work done by substituting tractor equipment for the usual one-mule, four-furrows-per-row methods in land preparation. Standard mechanical transplanters can be used profitably for setting. New designs for transplanter water valves and opener shoe attachments were found superior to existing designs. Tractor-drawn cart transplanters, making use mostly of junk automobile parts, were designed and tested, as were direct tractor-attached transplanters, a special rotary hoe for early cultivation and tractor-attached cultivator tools for later cultivation, covering at least one row per trip, equipment for cutting vines simultaneously with the digging for use with plow or middle-buster and mechanical diggers. The equipment requires variation in design and adjustments of diggers, depending upon conditions, and utilization of the crop. Improved efficiency in the use of middle-buster digging of sweetpotatoes for starch use can be accomplished by rod-wing attachments for both mule and tractor models. Plow-type diggers are best for sweetpotatoes that are to be stored. Adaptations in design and adjustment of operation for their improved efficiency were worked out. The plow bottoms should be at least 16 in. wide and operated under the row so as to turn out the hills with little injury. A maximum of soil-sweetpotato separation results in much bruising and other injury permissible for immediate industrial utilization. Standard commercial models of mechanical Irish potato diggers of the elevator rod-link chain type were found suitable for digging sweetpotatoes if equipped

with wide blades and operated at proper depth and chain speed. A directly tractor-attached mechanical digger proved efficient and practical for large-acreage growers.

Untrained labor gathered better after mechanical digging than after middlebuster digging. High yields were gathered with less time per ton than low yields, and a lower percentage of the crop was left in the field. Bagging sleds and carts, field crates, and dump trucks lower the cost of harvesting by saving labor time.

Power buck rakes, L. F. LARSEN (*South Dakota Sta. Cir. 49 (1944), pp. 19+, illus. 25*).—The rakes described range from one of a small, light type, mountable on an automobile and provided with a hand lift operated by a pull rope, to large machines having power lifts, and requiring auxiliary wheels if mounted at the front of the tractor by which they are driven. A diagram shows the manner in which a lift for heavy buck rakes may be constructed from transmission, drive shift, and rear-end mechanism, minus the wheels, attached to an old automobile. This arrangement takes its power from the fan belt or from a pulley mounted just in front of the fan. Similarly constructed lifts for tractor-driven rakes are operated from the power take-off. Methods for adapting horse-drawn buck rakes for use with the tractor or automobile are discussed. A stacker-buck rake combination, mainly of wood construction, is also described. Photographs and diagrammatic drawings are included, but dimensions are not specified because of the necessity for adapting the devices shown to the parts and materials available. Comparative advantages of front and rear attachment of buck rakes are discussed.

Chemical seasoning of lumber, H. S. NEWINS. (Univ. Fla.) (*Fla. Acad. Sci. Proc., 5 (1940), pp. 85–95, illus. 2*).—The principle discussed is that of the application of a hygroscopic compound to the outer surface of the wood to induce a descending vapor pressure gradient from core to shell and so to avoid the tensions and distortions caused by the shrinking of the outer layers before a like contraction of the core can take place. Urea was found to be effective and to cause no corrosion of metals placed in contact with the wood. Its cost is believed low enough to permit its use and it sufficed to improve markedly the uniformity of drying and of shrinkage.

The farm building repair program, J. C. WOOLEY. (Univ. Mo.). (*Agr. Engin., 25 (1944), No. 3, pp. 90, 92, 93*).—The generally familiar sources of building damage and deterioration are briefly discussed, with some suggestions as to means for avoiding or lessening such damage. The remainder of the article is given to the outlining of a scheme for arousing farming interest in repair and restoration work suited to current conditions, a method consisting largely in the promotion of a systematic series of news stories, the farm building specialist first supplying facts to publicity men, charts, slides, bulletins, check sheets, etc., to agents and teachers. The subsequent features of the proposed program are also outlined. Though saving of labor and material is recognized as of great importance, "we must be careful that we do not carry our saving to the point where it interferes with our main objective, the food production program."

Wartime repair of farm structures, C. A. MATTHEWS (*Agr. Engin., 25 (1944), No. 3, pp. 91–92, illus. 2*).—The author discusses the results of a survey to determine, for one State, the conditions with respect to the need for repair of farmhouses, barns, and other buildings. From the viewpoint of a commercial interest in metal roofing, a detailed survey of roof condition in 2 counties (330 buildings) was made, together with a more general survey of 3,874 buildings in 20 counties. The data brought together in this way indicate urgent need for a building repair program in the parts of Missouri covered by these surveys.

Dairy cow housing under study, S. A. Witzel and G. R. Barrett. (Univ. Wis.). (*Agr. Engin., 25 (1944), No. 3, pp. 83–85, 89, 95, illus. 4*).—From a dairy barn research project, of which a plot plan and floor plan accompany this article, conclusions thus far drawn were, in part, as follows, with respect to the climatic conditions met in Wisconsin: (1) High-production cows in a cold pen barn may be expected to produce well within 10 percent of the amount of milk they would produce in a warm stall barn. Daily production did not seem to be affected by changes in temperature. (2) Calves thrive in the cold barn almost as well as in the warm barn. (3) Bedding requirements of the pen barn are from two to three times as great as in the stall barn. (4) Health conditions of both calves and cows were good in the open pen barn. There were no swollen hocks and knees as in the stall barn. The stall barn was designed with stall widths of 4 ft. 10 in. and curbs between stalls to eliminate this cause of trouble. (5) In the pen barn the feed area should be separated from the bedded area and cleaned daily. (6) Space should be provided for from 3- to 4-ft. depth of manure in the loafing area and approximately 75 sq. ft. of area per large cow. The manure pack is solid and covered with clean bedding at all times. Less space will reduce cost but increase bedding requirements to maintain cleanliness of animals. (7) To be satisfactory the milking room must include milking stalls at least 3 ft. 9 in. wide for large cows; enough stalls to allow for not more than 5 cows per stall each hour during milking and feeding of concentrates, 12 min. being about the minimum time for the cow to come in, eat grain, be milked, and go out; insulation, heat, and ventilation; and running water, floor drain, sediment trap, and waste disposal. (8) Milk of high quality can be produced in the pen barn milking room. Morning milking in the stall barn is usually done over a gutter filled with manure. (9) In planning or designing a stall barn the addition of more cow pens for the average barn would seem a profitable investment. The health of cows confined to stanchions can be protected if they can be placed in a pen at the first signs of joint injury, loss of appetite, or other trouble where freedom of movement might help. These pens can have a cow in each at all times so that each pen will at least take the place of one stanchion or stall.

Stack-trench silos, O. J. Hill, A. A. Spielman, and F. B. Wolberg (*Wash. State Col. Ext. Cir. 58 (1943), pp. 4, illus. 5*).—Stack trenches placed entirely below ground, partly above ground with board sides, and earth-covered surface stacks are described. Drawings indicate essential measurements. The filling and management of such silos are briefly set forth and causes of common difficulties and failures are explained.

The Washington colony brooder house (*Wash. State Col. Ext. Poultry Pointers No. 24, rev. (1943), pp. 4, illus. 5*).—The design here presented is intended for the use of those poultrymen who desire to brood and rear a small flock of pullets each year. The ground dimensions are 10 by 14 ft. Shed roof and gable roof forms are shown in working drawings. The capacity is for 300 day-old chicks or 150 8-week-old pullets.

Photo-plan of a straw loft laying house. (Coop. U. S. D. A.). (*Maryland Sta. Bul X–1 (1944), pp. [4], illus. 9*).—Details of a 20- by 20-ft. house are indicated by dimensional lines drawn in on photographs. Invisible detail is indicated as in standard drawings by added dotted lines. A bill of materials accompanies the illustrations. The design was developed especially to meet Maryland conditions.

Germicidal and heat lamps for poultry, L. C. Porter (*Agr. Engin., 25 (1944), No. 3, p. 94, illus. 2*).—In discussing possible applications of these two types of lamps in poultry houses when the lamps can again be made generally available, the author mentions experiments showing that a single 30-w. germicidal (ultraviolet light) lamp can free 4,000 cu. ft. of air from bacteria to the same

degree that 100 air changes per hour will do. In air ducts of air conditioning systems the germicidal lamps are less effective, but a 30-w. lamp can disinfect from 500 to 600 cu. ft. per minute. Diagrams indicate ways in which the ultraviolet lamps can be so placed as to avoid exposure of the birds' eyes to the direct radiation.

Use of heat lamps for warming the feeding area adjacent to the brooder is also diagrammatically illustrated.

Home fruits and vegetable storage, J. C. SNYDER (*Wash. State Col. Ext. [Bul.] 209, rev. (1943), pp. 25, illus. 10*).—In this revision the author discusses temperature, humidity, ventilation, size of the storage unit, insulation, moisture proofing, types of storage units (including underground storages, pits, and basement and above-ground types), arrangement within the storage, painting the storage, preparation of products for storage, leaving vegetables in the field over winter, and special considerations in storing miscellaneous specified crops.

Sewage and garbage disposal on the farm, J. W. ROCKEY and J. W. SIMONS. (*U. S. Dept. Agr., Farmers' Bul. 1950 (1944), pp. 30+, illus. 20*).—This supersedes Farmers' Bulletin 1227 (E. S. R., 46, p. 891).

AGRICULTURAL ECONOMICS

Profitable farm organization in northwestern Indiana (type-of-farming area 1), L. ROBERTSON (*Indiana Sta. Bul. 491 (1944), pp. 35, illus. 4*).—This bulletin, which discusses the relationship of farm organization to income, is a companion bulletin to No. 452 (E. S. R., 84, p. 404) on the importance of different farm-management factors in the same area and which discussed the relationships of efficiency factors to income. The present bulletin is based on an analysis of farm accounts of approximately 50 farms for each of the 12 yr. from 1929 to 1940. The farms included were grouped into five classes. The total numbers of records summarized during the 12-yr. period for each group of farms were: Specialized dairy 146, dairy with side lines 149, livestock 114, crop 141, and miscellaneous 42. Comparisons are made of the different groups of farms (other than the miscellaneous farms) as to organization, efficiency factors, year-to-year variation in organization, and income. Other sections deal with the relationship of soil to type of farming and conditions which favor various enterprises. The method used and results obtained are described for two farms which returned high incomes over a period of years and conserved soil resources. A table gives "suggested farm organization set-ups and quantities of feeds, sales, and purchases for each of six different soil and size-of-farm situations which are fairly common in area 1."

The average rate of interest earned on the capital on approximately 50 farms for the 12-yr. period was 4.3 percent, varying from —0.04 percent in 1932 to 11.9 percent in 1936. The yearly variations resulted mostly from variations in prices. Dairy farms with large side-line enterprises had higher incomes than the other types of farms (miscellaneous farms not considered) in 6 of the 12 yr., specialized dairy farms in 4 yr., and livestock and crop farms each in 1 yr.

"The prairie soils are adapted to greater production of corn and oats than the timber soils and have less permanent pasture. This difference in feed production pattern encourages a higher ratio of hogs to dairy cattle on prairie soil farms. Over the 12-yr. period farms that were operated in recognition of these and other differences associated with soils were most profitable."

A farm management survey of pump-irrigated farms in Buffalo County, A. W. PETERSON (*Nebraska Sta. Bul. 358 (1944), pp. 28, illus. 7*).—Data were obtained by interviews regarding 45 pump-irrigated farms for the crop year 1939 and for 63 such farms for the crop year 1941. Thirty-one of the records

for 1941 were upon farms included in the first survey. The farm organization—types of farming, use of land, number and kinds of livestock, capital, receipts, expenses, etc.—and the variations in income are analyzed and discussed for each year. Further analysis and discussion covers the factors affecting income—weather, prices, intensity of land use, size of business, labor efficiency, power and machinery efficiency, rates of production, combination of enterprises, etc. Charts show the distribution of returns per worker on farms grouped as to productivity and efficiency in the use of labor and machinery and on farms average or above in productivity of land, size of business, corn yield, efficient use of labor and machinery, or average or above in any three, two, one, or none of these factors.

California farms: To buy or not to buy, R. L. Adams (*California Sta. Cir. 358 (1944), pp. 12*).—This publication is intended mainly for the prospective operator whose land must provide for family expenses, farm expenses, payments on any mortgage or borrowings, and maintenance of the farm's capital structure. Suggestions are given of points to be considered, such as optimum time for purchases, fluctuations in values, basis for selection, aids to appraisal, and special circumstances.

The agriculture of Greece, C. E. Whipple (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 8 (1944), No. 4, pp. 75–96+, illus. 1*).—"Despite its mountainous surface and maritime position, Greece is essentially an agricultural country. Landholdings are, however, relatively small and farming methods outmoded. Some farmers have been inclined to overemphasize a single crop, with consequent dependence upon purchases of other products needed for subsistence, and the country as a whole has depended heavily upon imported supplies of many agricultural items. Because of their low standards of living, however, the peasants have been able to produce most of their own necessities, except wheat. Even in the face of wartime conditions, they manage to carry on, and their crops have been less affected than those of some other European countries."

Redirecting farm policy, T. W. Schultz (*New York: Macmillan Co., 1943, pp. 75+*).—The author states that the basic question which underlies this discussion is this: Do the present agricultural programs succeed in guiding and directing (1) the use of resources, and (2) the size, distribution, and use of incomes of farm people, and (3) the distribution of the food supply among consumers in such a way as to serve the general interest best? His material is organized into sections dealing with prices as goals or directives, resources and incomes, and positive proposals on the production and income side.

The proper size and location of corn stabilization stocks, G. Shepherd and D. G. Paterson (*Iowa Sta. Res. Bul. 321 (1943), pp. 24, illus. 5*).—This publication is intended to determine (1) the outside limits of the size of the stabilization stocks of corn maintained by the Commodity Credit Corporation and (2) where the stocks should be located.

The study of fluctuations in corn production in the past "shows that the outside limit of the size of stocks required to stabilize corn supplies is about 700 to 800 million bushels. The quantity required to meet sudden changes in demand is about 200 to 300 million bushels. Total stabilization stocks of about 1 billion bushels, therefore, would be adequate for stabilization purposes."

The stabilization stocks have been concentrated heavily in the western Corn Belt States. "Apparently, the surplus-producing character of the area is the chief determinant of the percentage of the crop that will be stored. If this is true, storage stocks will continue to accumulate most in the western part of the Corn Belt. This, however, is fortunate, since the western Corn Belt States are subject to much more severe and long-standing fluctuations in production than the Eastern States. Stabilization of stocks needs to be larger (in terms of per-

centages of production in each State) in the western part of the Corn Belt than in the eastern part in order to meet the larger fluctuations in production that take place there. The small reduction in concentration resulting from the effect of location differentials in the loan rate has brought corn stocks in the different States to approximately the proper relative sizes needed for efficient operation."

Cost, distribution, and utilization of farm machinery in Iowa, E. O. HEADY, J. A. HOPKINS, and E. G. MCKIBBEN. (Coop. U. S. D. A. et al.). (*Iowa Sta. Res. Bul. 323 (1943), pp. 57–104, illus. 4*).—Information was collected in 1941 on the stocks of 25 common farm implements on about 3,000 farms, selected at random in each county but representing all counties of the State. A total of 38,083 individual machines was reported. Data are tabulated as to the number of each kind, the number of power-operated and horse-drawn machines per 100 farms classified by type of farming area and size of farm, the machinery density per 1,000 acres of farm land, age and estimated life of the machines, annual use on farms of various sizes, ownership, tire equipment, cost of use, and other details.

Among the findings are the following: "Comparison of the annual service of all machines with that for the most used machines indicates that the excess capacity on Iowa farms is quite considerable. However, timeliness of operations tends to limit the duty of farm machines. Some excess capacity is desirable in order to cope with wet and backward seasons. . . . Pooling equipment should not be extended to the point where it might interfere with timeliness of operations."

Depreciation and interest make up the most important part of machine costs. Depreciation costs averaged 4.8 percent of the first cost of all machines and ranged from 3.2 percent for the wagon to 9.0 percent for the 5-ft. combine. Total annual cost averaged 10.9 percent of the first cost for all machines and ranged from 8.0 percent for the 7-ft. grain drill to 20.8 percent for the hammer mill feed grinder of 80 bu. per hour capacity. "Although there is some variation in total annual cost of machines by farm size, this cost does not differ greatly from the average of all machines in any case. However, large farms have a much lower machine cost per unit of service than do small farms. In many cases the cost per unit of service on small farms is greater than would be the customary charge for performing the operation."

Handbook of official grain standards of the United States (*U. S. Dept. Agr., Food Distrib. Admin., 1943, rev., pp. 101+, illus. 6*).—Included are the official grain standards for wheat, corn, barley, oats, feed oats, mixed feed oats, rye, grain sorghums, flaxseed, soybeans, and mixed grain. A second section (pp. 79–101) deals with some of the important features of grain inspection.

Wheat grading at country points (*U. S. Dept. Agr., 1944, AWI–86, pp.* [8], *illus. 15*).—This pamphlet shows how the grading is done and tells some things farmers can do to have better wheat to sell.

Veal calf prices in Indiana, E. L. BUTZ and E. G. BYER (*Indiana Sta. Bul. 493 (1944), pp. 19, illus. 18*).—It is the purpose of this bulletin to provide material which will aid in an understanding of the characteristic behavior of veal calf prices in Indiana. Much of the analysis is based upon the Indiana farm price of calves and upon price and marketing data for the Indianapolis market. Among the topics discussed are annual price changes; weights and grades of veal calves; seasonal, daily, and geographic price variations; and production and marketing practices affecting veal prices.

Handbook on major regional farm supply purchasing cooperatives, 1941 and 1942, J. G. KNAPP (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 67 (1943), pp. 61+, illus. 7*).—Part 1 of this handbook consists of individual reports for 17 major regional farm supply purchasing cooperatives for fiscal years ended

in 1941 and 1942. Part 2 gives combined information as to age of organizations, area of service, type of retail outlet, number of patrons served, number and type of employees, volume of business, type of supplies handled, distribution of savings, financial condition, and source of net worth.

An appendix gives data as to the value of supplies distributed by the three associations making the largest distributions.

Farmers' marketing and purchasing associations (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 68 (1943), pp. [324+]*).—This is a directory prepared from reports received by the Cooperative Research and Service Division. It is arranged by commodities, with keys as to functions performed and dollar volume of business.

War adjustments of feed cooperatives in the East and Middle West, L. F. Rickey (*U. S. Dept. Agr., Farm Credit Admin., 1943, W. C. 13, pp. 39+, illus. 14*).—This survey covers 12 regional cooperatives operating in 20 Eastern and Midwestern States. The impact of the war on formulas, transportation, personnel, credit, and other functions is described, as are also the outstanding readjustments.

Commodity futures statistics, July 1940–June 1941 and July 1941–June 1942 (*U. S. Dept. Agr., Agr. Market. Admin., 1942, pp. 30+; 1942, pp. 33+*).—This publication is a digest of statistics of futures trading in agricultural commodities under the Commodity Exchange Act. Tables, usually on a monthly basis, cover volume of trading, open contracts, futures prices, contracts settled by delivery, and trades and commitments of reporting traders for the respective years.

Commodity futures statistics, July 1942–June 1943 (*U. S. Dept. Agr., War Food Admin., Off. Distrib., 1944, CS–7, pp. 38+*).—A continuation of the statistics noted above.

RURAL SOCIOLOGY

Farm population changes in eastern Kentucky, 1940–1942.—Progress report, H. W. Beers. (Coop. U. S. D. A. et al.). (*Kentucky Sta., 1943, pp. 18+, illus. 3*).—Farm population in eastern Kentucky declined rapidly during the 2 yr. 8 mo. following the census of April 1, 1940. The estimated loss in 33 counties was slightly more than the total gain during the 10 yr. 1930–40. Out-movement up to the time of the survey was largely individuals leaving singly, and maintaining their connection with family and kin. Many who had gone were heads of families who thus became temporarily separated from them. These facts imply a large return movement should demobilization of the armed forces and liquidation of war industries occur suddenly. Farm population decline was greatest in the young adult and middle-aged groups. The number of males aged 15–34 was 40 percent smaller on December 1, 1942, than on April 1, 1940. Practically all of the migration to December 1942 was to defense jobs in nonagricultural industries, principally in the Ohio Valley, Great Lakes, and eastern cities. Though many of the migrants obtained skilled jobs, the majority were at semiskilled construction work or in service tasks requiring little technical training.

Population situation and trends in Tennessee as a whole, F. N. Masters and C. E. Allred (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 166 (1944), pp. 41+, illus. 22*).—The decennial rate of population increase has been downward in Tennessee, reaching a record low of 7.0 percent between 1910 and 1920, but rose to 11.4 percent between 1930 and 1940. During this time the United States reached a record low of 7.2 percent in rate of increase. Total population in Tennessee increased from 2,616,556 in 1930 to 2,915,841 in 1940, which was approximately 33.6 percent of the increase in the entire east

south central region (Kentucky, Tennessee, Alabama, and Mississippi). Population 50 yr. or older in Tennessee increased from 10.7 percent of the total population in 1890 to 17.2 percent in 1940. Rural population decreased slightly from 1910 to 1930 in Tennessee, but increased from 1,720,018 in 1930 to 1,888,635 in 1940.

Rural reconstruction in Mexico, D. S. HATCH (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Amer., 4 (1944), No. 3, pp. 51–53, 57, illus. 4*).—The author calls attention to efforts being made toward helping small farmers near Tepoztlan to restore soil productivity, diversify their crops, and improve their living standards.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

What agricultural extension is, C. B. SMITH (*U. S. Dept. Agr., 1944, pp. 6+*).—The information contained in this leaflet was presented in an address before the annual conference of the U. S. D. A. extension staff in January 1944. The author defines agricultural extension as "a partnership agency in which the officials of government—Federal, State, and county—sit in council with rural people and together analyze local conditions, take stock of their resources, and make and help to carry out programs for the financial, educational, and social benefit of the community and its individual members."

A card game designed as an aid in teaching the characteristics of gilled mushrooms, C. L. PORTER. (Purdue Univ.). (*School Sci. and Math., 44 (1944), No. 3, pp. 260–262*).—The principle used in the old game of "Authors" is applied to teaching the characteristics of gilled mushrooms preparatory to field identification.

FOODS—HUMAN NUTRITION

Index to the literature of food investigation, A. E. GLENNIE and C. ALEXANDER ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Index Lit. Food Invest., 14 (1942), No. 3, pp. 151–225+; 14 (1943), No. 4, pp. 227–303+*).—These annotated bibliographies contain approximately 500 literature citations apiece classified with various subdivisions under the following main headings: Meat; pig flesh; poultry and game; fish; eggs; dairy produce; fats and oils; fruit and vegetables; grain products, crops, and seeds; theory of canning; theory of freezing and chilling; bacteriology; mycology, engineering; and miscellaneous. Author indexes are also given.

Nutritive value of U. S. food supply, 1930–43 (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation, 28 (1944), No. 3, pp. 22–23, illus. 2*).—Charts are presented to indicate the trends of per capita production and consumption of foods in the United States, 1930–43, and the related trends in nutritive value of the food consumed. Nutritive value, expressed on the basis of index numbers (1935–39=100), is broken down into consideration of individual food nutrients (energy, protein, individual minerals, and vitamins). The figures used in this presentation represent slight revisions of those used in the fuller discussion of the trends noted earlier (E. S. R., 90, p. 847).

Wartime shifts in utilization of food and feed, W. E. KRAUSS (*Ohio Sta. Bimo. Bul. 227 (1944), pp. 119–128*).—A survey of present food consumption levels and patterns as compared with the pre-war picture indicates that although previous dietary habits cannot be completely ignored many changes can be satisfactorily effected. The possibility of further shifts is explored in the light of world needs and the relative nutritive merits of various classes of food and the efficiency of their production. From these considerations a food-production pattern for the future is postulated. Finally, it is emphasized that "by using

foods more efficiently and in more varied ways, by reducing waste, and by learning and applying nutritional principles in the home and in the feed lot, we not only will be tiding ourselves over a critical period but will be well on the road to that degree of physical perfection that conserves a nation's greatest natural resource—its people."

Palatability studies on poultry: A comparison of three methods for handling poultry prior to evisceration, G. F. Stewart, H. L. Hanson, and B. Lowe. (Iowa Expt. Sta.). (*Food Res., 8 (1943), No. 3, pp. 202–211, illus. 1*).—This paper presents the results of a study made to evaluate the quality of commercially handled poultry eviscerated (and disjointed, packaged, and quick-frozen) after a relatively short chilling period or after being held, New York dressed, in the frozen state (brine-spray or the quick-freezing process) for periods up to 6 mo. or a year. Aroma and palatability scores on birds handled by these several methods were compared with one another and with scores on fresh control birds eviscerated and disjointed immediately after dressing, then chilled for 15–23 hr. before cooking. The significance of all scores was determined by analysis of variance.

Consideration of all the results indicated that birds which were brine-spray frozen within 5 hr. after dressing and stored up to 6 mo. before eviscerating were superior in quality to birds eviscerated 18 hr. after dressing, then frozen and stored for the 6 mo. period. Birds chilled for 18 hr., then sharp-frozen and held up to 6 mo. before eviscerating were distinctly inferior to those in either of the first two treatments. The fresh controls had higher scores than any of the treated birds. Occurrence of off-odors and flavors in the carcass appeared to be lessened by decreasing the length of time the undrawn poultry was held above freezing. It was observed also that off-odors and flavors and loss of juiciness, which were apparently independent of the treatments studied, developed in all stored poultry. The changes in flavor and aroma were particularly noticeable in the liver, and loss of juiciness occurred in all edible portions. Loss of juiciness in frozen poultry was not influenced by freezing twice or by differences in freezing rates used. A miscroscopic study of the muscle fibers showed that some change occurred in the physical structure of the stored frozen muscle. It is considered that New York dressed poultry frozen by the brine-spray process described could be held for eviscerating later with no loss in quality over present methods which involve evisceration of chickens after dressing, chilling, and holding for 6–96 hr.

Preparation and keeping quality of lightly smoked mackerel, M. E. Stansby and F. P. Griffiths (*U. S. Dept. Int., Fish and Wildlife Serv., Res. Rpt. 6 (1943), pp. 10+*).—This report describes the method used in the experimental production of a lightly smoked product similar to finnan haddie or kippered salmon. The product has a mild smoke flavor that blends with, but does not overshadow, the natural mackerel flavor. Although it is perishable, its storage life may be greatly extended by freezing and holding in frozen storage. Brining before smoking and freezing, use of moistureproof paper wrappers, and storage at low temperatures retard development of rancidity and permit storage up to 6 mo.

Pasteurization and the nutritive value of milk, C. A. Elvehjem. (Univ. Wis.). (*Canad. Dairy and Ice Cream Jour., 22 (1943), No. 11, pp. 58, 60, 62*).—This review indicates in conclusion that "pasteurization of milk causes such a very small loss in nutritive value that the safety resulting from the destruction of disease germs greatly outweighs the small loss in milk value as a human food."

The constituents of wheat and wheat products, C. H. Bailey (*New York: Reinhold Pub. Corp., 1944, pp. 332, illus. 17*).—This book presents a compilation

of the significant facts and data relating to the substances naturally present in wheat and its several structures, and in its milled products. The scope of the work is indicated by the chapter headings, as follows: Early researches on wheat proteins; prolamins of wheat; glutelins of wheat; water- and salt-soluble proteins; crude protein and crude gluten; nucleic acid; nonprotein nitrogen; starch; sugars; gums, pentosans, hemicelluloses, and cellulose; lipides, phospholipides, and sterols; minerals; the halogens, sulfur, and selenium; acidity; wheat and flour pigments; and vitamins of wheat and wheat products. Extensive citations, many of them to older and to foreign literature, are given by footnote in connection with the immediate text. Author and subject indexes are included.

A comparison of the qualities of flours made from white wheat varieties grown in Montana when used for making cakes and cookies, J. E. Richardson (*Montana Sta. Bul. 416 (1943), pp. 32, illus. 14*).—This study was conducted cooperatively by the agronomy and home economics departments of the station and the Montana Grain Inspection Laboratory. The results are discussed in detail, and the results of the baking tests are made easy to visualize by well-selected photographs of the products. Cake- and cookie-making were used as the means of comparison. The qualities of the flours made from seven white wheat varieties grown in Montana (Baart, Federation, White Federation, Onas, Irwin Dicklow, Lemhi, and Erect) were compared in a 6-yr. study with flour from the Marquis variety (a hard red spring wheat) and commercial cake flours. Each year the test weight per bushel, grade, and protein content were determined for the experimental wheats, and 50 percent patent flours were milled from them, bolted through 13 or 14 XX cloth, aged, and tested for protein, moisture, and ash content.

When rolled sugar cookies, made from the various unbleached flours according to a formula developed in the Montana laboratory, were compared as to quality White Federation consistently produced cookies of superior quality, followed by Lemhi, Erect, Federation, and Irwin Dicklow varieties. Both unbleached and bleached flours made from the respective wheat varieties were used in preparing plain cakes, according to a formula also developed in the Montana laboratory. Among the unbleached flours, Baart produced the best cakes (considering both the volume and judges' scores), with White Federation second, Lemhi third, and Federation the poorest. Among the bleached flours, Onas produced the best cakes, with Lemhi second, Federation third, and Erect the poorest. "Apparently some different flour qualities are required in making cookies and cakes."

Evaluation of nutritive contribution of enriched white flour, R. D. Williams, H. L. Mason, and R. M. Wilder (*Jour. Amer. Med. Assoc., 121 (1943), No. 12, pp. 943–945, illus. 1*).—Data from the authors' previously reported studies of thiamine metabolism and requirements of human subjects (E. S. R., 90, p. 566) have been selected to illustrate the beneficial effects of the substitution of enriched flour for white flour in a diet constructed of foods commonly appearing on American tables, and to which the flour contributed about 30 percent of the calories and the sugar and other vitamin-free constituents about 15 percent. In a group maintained for 263 days on the diet with ordinary white flour, thiamine deficiency disease developed as shown by clinical signs and symptoms, low excretions of thiamine, and abnormal elevations of pyruvic acid in the blood after oral administration of dextrose. Other subjects maintained on an identical regimen except for the substitution for the white flour of an enriched flour to which 6 parts of skim milk solids had also been added per 100 parts of flour showed a reasonably satisfactory nutritional status with only very mild signs of thiamine deficiency. A third group, receiving whole-wheat flour showed about the same condition at the end of the experiment as those on enriched flour. The report also includes a chart comparing the daily intakes of thiamine and ribo-

flavin by the subjects of the study with the minimal daily requirements as determined by the authors and the recommended allowances of the National Research Council. This comparison showed that while the diet containing white flour furnished less than the minimal requirements of both thiamine and riboflavin (with a greater deficiency of thiamine), those containing either whole-wheat flour or enriched white flour met the minimal thiamine but not riboflavin requirements.

Accomplishments in cereal fortification, R. C. Sherwood (*Amer. Jour. Pub. Health, 33 (1943), No. 5, pp. 526–532, illus. 1*).—This paper reviews briefly the background of the fortification program leading to the setting of a standard for flour (and bread), and discusses some of the practical problems in the production of enriched flour and the practices and problems involved in the restoration of cereal foods.

The role of the germ in the nutritive properties of the cereal grains, E. W. Crampton and G. C. Ashton (*Sci. Agr., 23 (1943), No. 8, pp. 445–450*).—Food intake and growth response were observed in 70-gm. rats on a basal ration of degermed wheat and a protein-mineral mixture supplemented in the test groups either with wheat germ or corn germ at a 2.1 percent level or with a vitamin mixture supplying 20γ of thiamine chloride, 25γ of riboflavin, 20γ of pyridoxine, and 85γ of pantothenic acid daily. As measured by the results obtained with these supplements of synthetic vitamins, the wheat germ appeared to furnish a considerable amount of the B vitamins, whereas the corn germ failed to increase the efficiency of the diet.

The contribution of non-fat milk solids to the nutritive value of wheat breads, H. H. Mitchell, T. S. Hamilton, J. B. Shields, and J. R. Beadles. (Univ. Ill.). (*Jour. Nutr., 25 (1943), No. 6, pp. 585–603, illus. 3*).—Nine experimental breads varying in their contents of nonfat milk solids, "enriching" nutrients, and white or whole-wheat flour were used in feeding tests with growing rats. Analytical data are reported for the thiamine and riboflavin contents of the dried skim milk and the white and whole-wheat flours and for proximate constituents, minerals (Ca, P, Fe), and vitamins (thiamine, nicotinic acid, riboflavin) of the nine breads. There was no loss of riboflavin in the baking of the bread and in general only a small loss of thiamine. The crust contained 27 percent less thiamine than the crumb on the dry basis. The nonfat milk solids to the extent of 6 percent of the white flour increased the riboflavin content of the white bread to the level of that of whole-wheat bread. This milk bread effected better growth and bone calcification than did white bread enriched with thiamine, nicotinic acid, and iron. Enrichment of the milk bread did not further improve its capacity for promoting growth but did slightly increase its hemoglobin-producing quality. Enriched white bread supplemented with 6 percent of dried skim milk was definitely superior in growth-promoting quality and hemoglobin production, but slightly inferior in bone calcifying value, to that supplemented to an equal extent with dicalcium phosphate and riboflavin. The enriched milk bread was equal to whole-wheat bread in growth promotion and hemoglobin production and distinctly superior in promotion of bone calcification. Apparently there was something in the whole-wheat flour as compared with the patent white flour that impaired calcium utilization.

Determinations of nicotinic acid, thiamine, riboflavin, and iron in carcasses of some of the experimental rats indicated that regardless of the intake of nicotinic acid the amount in the tissues of the growing rat depended on the amount of growth induced; that the concentration of thiamine in the tissues, much more than that of riboflavin, was sensitive to variations in intake of the corresponding vitamin; and that induced increases in hemoglobin concentration were associated with increased concentration of body iron, although changes in

carcass iron concentration were not always associated with changes in hemoglobin values. It is concluded that "enrichment of white bread with thiamine, nicotinic acid, and iron (and also with riboflavin) is not the equivalent of enrichment with nonfat milk solids. Nonfat milk solids definitely improve the nutritive value both of enriched white bread and of whole-wheat bread."

Variations in chemical composition of raw and canned peas, O. R. Alexander, E. D. Sallee, and L. V. Taylor (*Food Res., 8 (1943), No. 3, pp. 254–264, illus. 1*).—Data are presented for the proximate constituents and calcium and magnesium in 48 samples of fresh raw peas and 129 samples of canned peas, the latter drained for analysis. The raw peas included Alaska, Pride, Alderman, Perfection, and Profusion varieties, harvested from one of the major pea-growing regions of Wisconsin during the season of 1941. The canned peas included (1) market samples of the conventional commercially canned peas of the 1940 and 1941 packs obtained from major pea-canning districts and representing different varieties, grades (sieve size and quality), and can sizes, and (2) a few samples canned by the relatively new Blair process developed for better preservation of natural color and flavor. In this latter method, the peas were carried throughout the procedure in a slightly alkaline environment and were given a short process of 7 min. at 126.7° C. The data show a wide variation in the composition of both the raw canning stock samples and the canned peas. These two sets of data, as well as those for controlled experimental packs, show that there is a slight decrease in the concentration of protein, carbohydrate, calcium, and magnesium during the canning procedure. In the experimental packs peas from the same lot of raw stock were canned by the conventional and the Blair processes and were analyzed after the different steps in the canning procedure. The data obtained showed that peas canned by the two procedures were similar in composition, differing chiefly in a slightly higher magnesium content in the Blair-process peas.

Food dehydration, J. C. Patterson (*Refrig. Engin., 45 (1943), No. 6, pp. 401–404, 438, illus. 4*).—This summary of developments in food dehydration points to the need for increased production of dehydrated foods and discusses present methods of dehydration, including brief descriptions of the four general types of dehydrating units and enumeration of the basic requirements of a multistage tunnel dehydrator. Attention is called to the growing importance of compressing dehydrated foods, this process requiring the use of subfreezing temperatures before and during the compression to prevent tissue and cell break-down under the high pressures used.

Annual review of physiology, VI, edited by J. M. Luck and V. E. Hall (*Stanford University, Calif.: Amer. Physiol. Soc. and Ann. Rev., Inc., 1943, vol. 6, pp. 630+*).—Included among the reviews presented in this volume (E. S. R., 91, p. 95) are the following of particular interest from the standpoint of nutrition: Energy Metabolism, by M. Kleiber (pp. 123–154) (Univ. Calif.); Digestive System, by B. Slutzky and A. C. Anderson (pp. 225–246); Liver and Bile, by L. A. Crandall, Jr. (pp. 247–264) (Univ. Tenn.); Kidney, by E. Braun-Menendez (pp. 265–294); Blood, by A. J. Quick (pp. 295–318); Vision, by F. W. Weymouth (pp. 391–426); Metabolic Functions of the Endocrine System, by F. G. Young (pp. 427–482); Reproduction and Its Edocrine Control, by A. S. Parkes (pp. 483–516); and Industrial Physiology, by E. Simonson (pp. 543–576).

Assessing the physical condition of children.—I, Case demonstration of failing growth and the determination of "par" by the Grid method. II, Simple malnutrition: A problem of failing growth and development. III, The components of physical status and physical progress and their evaluation, N. C. Wetzel (*Jour. Ped., 22 (1943), Nos. 1, pp. 82–110, illus. 1; 2, pp. 208–225, illus. 4; 3, pp. 329–361, illus 10*).—In these three papers, the Grid technic

of appraisal of the physical condition of children is described in detail and its use demonstrated in the detection of simple malnutrition and in the evaluation of physical status in terms of three components—physique, development, and nutritional grade. Numerous Grid records and photographs are used in illustration.

Some nutritional principles of mass feeding, G. H. Berryman and P. E Howe (*Jour. Amer. Med. Assoc., 122 (1943), No. 4, pp. 212–216*).—The chief nutritional principle for diet planning discussed is that of equivalent substitution of one type of food for another of similar nutritive content. This principle has been discussed in some detail from the standpoint of diet calculations in earlier papers by Howe, Pritchett, and Berryman (E. S. R., 88, p. 845) and Berryman and Chatfield (E. S. R., 90, p. 558). In the present report, definite examples are given of means of making the diet fully adequate if one or another of the foods commonly considered essential should be decreased or entirely removed. Thus, it is shown that the entire removal of eggs would result in the lowering of many of the nutrient components of a satisfactory diet, most important of which would be riboflavin, but that this might be compensated by small extra quantities of liver or certain other cuts of meat or by extra milk or enriched bread containing riboflavin. Other diet recommendations are similarly discussed, including the consumption every day of two vegetables, one of which is leafy, green, or yellow; two fruits, one of which is citrus; a certain quantity of cereals and grain products; and one serving of meat (or fish). "While a single food pattern may be the practical solution in the attainment of adequate nutrition for the individual layman, yet it is quite unnecessary to gage the adequacy of a diet in regimented terms. Nutritional adequacy is attainable by a variety of means, and it is not necessarily restricted to one set food pattern. The intelligent use of foods presupposes a thorough knowledge of what, nutritionally speaking, the food group may be expected to contribute in normal times, as well as its potentialities when logistics or restriction of supply of certain types of food interfere with 'the pattern.' Our nutritive requirements are for nutrients, not for certain foods as such."

The amino acid composition of animal tissue protein, E. F. Beach, B. Munks, and A. Robinson (*Jour. Biol. Chem., 148 (1943), No. 2, pp. 431–439, illus. 1*).—"The amino acid composition of the protein mixtures of 10 edible muscle meats (beef, veal, lamb, pork, chicken, turtle, codfish, salmon, frog legs, and shrimp) and of 6 beef organ tissues (liver, kidney, brain, heart, stomach, and lung) is presented. The determinations of amino acid distribution included arginine, histidine, lysine, tyrosine, tryptophane, phenylalanine, serine, threonine, cystine, and methionine, 7 of which are nutritionally essential for optimal animal growth, either through a limited ability or a total inability of the body to synthesize them. The protein mixture which makes up voluntary muscle tissues is similar in Mammalia, Aves, Amphibia, Pisces, and Crustacea, with respect to 10 of the constituent amino acids. Since muscle tissues of these various classes of animals do not differ widely in their amino acid patterns, the findings support the belief that the same or closely similar amino acid composition of muscle proteins is repeated through the animal kingdom. Larger differences in amino acid composition were found among the beef organs than among the muscle proteins of different species, as would be expected from their higher concentration of nuclear material and different functional activities. In addition to an evaluation of the relative dietary values of the animal proteins in terms of 10 specific amino acids, the data demonstrate the amino acid pattern to which animal muscle must conform in the synthesis of tissue protein."

Ten amino acids essential for plasma protein production effective orally or intravenously, S. C. Madden, J. R. Carter, A. A. Kattus, Jr., L. L. Miller,

and G. H. WHIPPLE (*Jour. Expt. Med., 77 (1943), No. 3, pp. 277–295*).—When standardized plasma-depleted dogs were given either orally or intravenously a certain mixture of amino acids in aqueous solution, plasma production was excellent and weight and N balance were maintained. The 10 amino acids comprising this growth mixture, which was as effective as most diet proteins in plasma production, were threonine, valine, leucine, isoleucine, tryptophan, lysine, phenylalanine, methionine, histidine, and arginine. Cystine was able to replace methionine in the mixture with no decrease in plasma protein for only a limited period (7–10 days) and then at the expense of the body tissues, that is, with weight loss and a negative N balance. Arginine was required in the mixture for fabrication of plasma protein in the protein-depleted dog, although it was apparently not needed for N balance for as long as 1–2 weeks. The omission of either threonine or valine resulted in a quick, sharp decline in plasma formation and a negative N balance. When histidine, arginine, and most of the lysine were omitted, N balance and weight could be maintained for as long as 1 week, but plasma protein fell off markedly. "The findings indicate that the growth mixture of amino acids should be a valuable addition to transfusion and infusion therapy in disease states associated with deficient N intake or tissue injury and accelerated N loss, including shock, burns, and major operative procedures."

The role of dietary protein in hemoglobin formation, A. U. and J. M. ORTEN (*Jour. Nutr., 26 (1943), No. 1, pp. 21–31*).—Five groups of rats were carried from weaning through a 76-day experimental period with food consumption recorded every fourth day and hemoglobin determinations and blood counts on the seventy-sixth day of the experiment. The "adequate-protein" group of rats receiving a diet adequate in protein (18 percent lactalbumin) and all other dietary essentials consumed an average of 8.8 gm. of ration daily, made excellent weight gains, and showed normal hemoglobin values and erythrocyte and reticulocyte counts. The "low-protein" group receiving a diet containing but 3.5 percent lactalbumin, but otherwise adequate, consumed 4.9 gm. of ration daily. These animals made little growth and showed a mild chronic anemia characterized by a subnormal hemoglobin content of the blood, a normal erythrocyte count, and an elevated reticulocyte count, the latter indicating a compensatory attempt of the bone marrow to increase erythrocyte output. The "calorie-weight" control group given an abundance of protein but a restricted intake of calories (equal to that of the low-protein rats) had an essentially normal blood picture indicating that the anemia of the low-protein animals was due to insufficient protein rather than low-calorie intake. The "inanition-control" group with the same caloric intake as the low-protein rats, but with a greater protein intake (although not equal to that of the adequate protein rats), showed an almost normal blood picture. The "high-calorie" group of rats with an adequate intake of calories but a restricted protein intake were even more severely anemic than the low-protein rats, demonstrating the inability of additional calories alone to improve the hematological picture. In continuation trials with the low-protein rats, those maintained on this regime for a year showed progressive increase in the anemia, while those given an increased amount of protein showed prompt remission of the anemia. Other rats, continued on the low-protein diet but with iron supplements, showed no consistent improvement, indicating the inability of added iron without increased protein intake to increase hemoglobin values. The conclusion is warranted that an adequate intake of dietary protein is essential for normal hemoglobin formation in the rat.

The metabolism of fat, I. SMEDLEY MACLEAN (*London: Methuen & Co., 1943, pp. 104+*).—This small monograph presents a critical account of some of the more important developments in our knowledge of fat metabolism. The scope is indicated by the following chapter headings: The method of synthesis of fatty

acids; the constitution of natural polyene unsaturated acids; the part played by the polyene unsaturated acids; the method of oxidation of the fatty acids; the method of combination of the fatty acids—glyceryl- and cholesteryl-esters, phospholipins, and galactolipins; and the method of transport of the fatty acids. The bibliography, arranged by chapters, totals over 200 references.

Rations for the study of the relative nutritive value of fats and oils, R. P. Geyer, R. K. Boutwell, C. A. Elvehjem, and E. B. Hart. (Univ. Wis.). (*Science, 98 (1943), No. 2553, p. 499*).—Further tests to determine the relative growth-promoting value of butterfat and corn oil for the albino rat employed a diet containing 48 percent lactose (and casein 20, fat 28, salts 4, and adequate vitamin supplements) instead of the 32 percent lactose previously employed (E. S. R., 89, p. 758). In these tests the weight gains in 6 weeks averaged 40 gm. more for the animals receiving butterfat than for those receiving corn oil. Moreover, the latter group showed rough and discolored fur coats, blood-stained noses, and scaly paws. Likewise, on a skim-milk-powder basal ration an increased level of lactose (milk powder 50, lactose 20, fat 30) accentuated the difference between butterfat and corn oil. When the lactose in this ration was replaced by dextrose butterfat showed essentially no superiority over corn oil in growth-promoting effect. "It is apparent that lactose has an as yet unknown effect on intestinal conditions which is counteracted by butterfat but not by corn oil."

The utilization of lactose by the fasting white rat, M. N. Coryell and A. A. Christman (*Jour. Biol. Chem., 150 (1943), No. 1, pp. 143–154*).—Young 160-gm. white rats, fasted for 24 hr., were given by stomach tube a 20-percent lactose solution at the rate of 2 gm. of lactose per kilogram of rat, and then sacrificed in a manner to insure rapid drainage of blood at intervals of 1, 2, and 3 hr. The liver and the entire gastrointestinal tract were quickly removed for analyses of the carbohydrates involved. The results showed that the rats hydrolyzed, on an average, 32, 59, and 73 percent of the lactose at the end of 1, 2, and 3 hr., respectively. The glucose from the hydrolyzed lactose was absorbed as rapidly as formed, 36, 65 and 78 mg. per 100 gm. of rat being absorbed in the 1-, 2-, and 3-hr. periods, respectively; the galactose was absorbed at a somewhat slower rate, with 26, 54, and 69 mg. absorbed in the same periods. Simultaneous study of the liver glycogen indicated that the amount of glycogen deposited corresponded roughly to one-third of the glucose and galactose absorbed. On comparable lactose intakes, the liver glycogen of the male rats was definitely higher than that of the female rats. The lactose was apparently a relatively good glycogen former. The comparatively small rise in blood sugar following the administration of lactose was consistent with the slow rate of glucose and galactose absorption, which, in turn, depended on the rate of lactose hydrolysis.

Differences in calcification between the humerus and femur of young rats receiving high calcium, low calcium, and stock diets, H. M. Bruce and E. W. Kassner (*Biochem. Jour., 37 (1943), No. 1, pp. 105–109, illus. 1*).—Data accumulated over a period of years in a laboratory where it was the custom to follow normal and pathological calcification of rat bones by separate analyses of the right humerus and femur were examined for evidence of differences in calcification of these two bones. The data represented ash values of dry defatted bones of animals on rachitogenic (high Ca and low P type), low Ca, and stock diets. When low calcification was due to shortage of vitamin D the femur showed an even lower calcification than the humerus; when due to a deficiency of Ca or P without simultaneous shortage of vitamin D in the diet, no difference in calcification between the two bones was observed. Neither was there a difference in the bones of rats receiving a stock diet. In the femur both the relatively large metaphysis and the extremely low calcification of this part made the ash content of the whole bone lower than that of the humerus when there

was a deficiency of vitamin D in the diet. The differences between the rachitic humerus and femur were not influenced by the sex of the animal.

The nature of the insoluble sodium of bone. The adsorption of sodium at forty degrees by bone, dentin, enamel, and hydroxyapatite as shown by the radioactive isotope, H. C. Hodge, W. F. Koss, J. T. Ginn, M. Falkenheim, E. Gavett, R. C. Fowler, I. Thomas, J. F. Bonner, and G. Dessauer (*Jour. Biol. Chem., 148 (1943), No. 2, pp. 321–331, illus. 3*).—Bone, dentin, and enamel were found to take up Na from solutions of NaCl containing radioactive Na. For each tissue the uptake was satisfactorily described by the Freundlich adsorption isotherm. The isotherms for the calcified tissues were numerically similar to that for hydroxyapatite, suggesting that the adsorption of Na in the calcified tissues took place on the surface of the mineral ultimate crystals. Bone adsorbed more Na than dentin, and dentin more than enamel. This is the order of increasing crystal size and therefore of decreasing surface area of the ultimate crystals. Although it was found that at blood Na levels the amount of Na found in the bone in vivo may be predicted by the adsorption isotherm, this is not considered proof that the bone Na is adsorbed in vivo. It is considered, however, that the adsorbing power of bone is great enough to account for the Na present in vivo.

The influence of antacids upon iron retention by the anemic rat, S. Freeman and A. C. Ivy (*Amer. Jour. Physiol., 137 (1942), No. 4, pp. 706–709*).—Rats made anemic on a milk diet were given orally a daily mineral supplement of 0.25 mg. of iron as ferric chloride and 0.05 mg. each of copper and manganese as their sulfates. Aluminum hydroxide and aluminum phosphate fed in milk as 5 and 4 percent suspensions, respectively, and calcium carbonate and magnesium trisilicate fed as dry powder mixed with finely powdered cane sugar were given to test groups of the anemic rats. The hemoglobin response of these animals as compared with that of the controls receiving no antacid preparation showed that calcium carbonate and aluminum hydroxide definitely reduced the iron retention of the anemic rat receiving an iron supplement of 0.25 mg. daily. Magnesium trisilicate reduced iron retention somewhat but to a degree of questionable significance. Aluminum phosphate did not reduce iron retention. "It is suggested that the iron intake needs to be greater in individuals consuming increased amounts of aluminum hydroxide or of calcium carbonate than in the normal subject."

Further study of boron in the nutrition of the rat, J. D. Teresi, E. Hove, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). *Amer. Jour. Physiol., 140 (1944), No. 4, pp. 513–518*).—Young rats from mothers on a low-boron basal ration were continued on this ration, some with and others without a boron supplement for sodium tetraborate at the level of about 40 μg. per rat per day. The basal ration, the same as the one used in a previous study (E. S. R., 83, p. 531) and containing 155 μg. of boron per kilogram, supplied each rat about 1.55 μg. of boron per day. In these trials the boron supplement did not improve the growth rate, indicating, in confirmation of findings in the earlier study, that the daily intake of 1.55 μg. satisfied the boron requirement. Further trials with the basal ration modified by substitution of fat for much of the sugar achieved a lowered boron intake (0.6 μg. per rat per day) on an isocaloric intake. Addition of boron to this low boron ration did not improve the rate of growth, indicating that if boron is needed for normal growth 0.6 μg. per rat per day satisfies the requirement. A diet purified by driving off boron as volatile methyl borate contained only 25 μg. of boron per kilo. This ration failed to support growth, probably because the casein had either been denatured or esterified with methyl alcohol. The addition of boron to a basal ration con-

taining 155 μg. of boron per kilogram did not improve the ability of rats to nurse their young through the nursing period.

Studies on the physiology of manganese in the rat, L. W. Wachtel, C. A. Elvehjem, and E. B. Hart. (Univ. Wis.). (*Amer. Jour. Physiol., 140 (1943), No. 1, pp. 72–82, illus. 2*).—In this study, to determine the fundamental body processes in which Mn is involved, growth rates and general appearance of the rats were observed, basal and nitrogen metabolism were determined, bone studies were made, phosphatase (in blood and bone) and hemoglobin were determined, and pituitary studies were made. The results presented and discussed in detail showed that synthetic rations with varying Ca : P ratios and providing only 5γ of Mn per rat per day did not support normal growth, the impairment being more pronounced with rations having a high Ca : P ratio. The Mn-deficient rats had poorer bone formation than is characteristic of normal animals with about 5 percent less ash (15 percent less per unit volume) but with the Ca : P ratio of the ash unchanged. A slight progressive anemia was noted in the deficient animals, and hemoglobin regeneration was decreased. Paired feeding trials showed the same differences in growth, bone, and hemoglobin as in animals fed ad libitum. No differences in bone phosphatase were found, but a two- to threefold increase in blood serum phosphatase was present. Blood Ca and P values were normal, although a slight decrease in P absorption was observed. Anterior pituitary extracts appeared to have some effect in stimulating growth of deficient animals for a short time.

Further studies on the symptoms of manganese deficiency in the rat and mouse, M. E. Shils and E. V. McCollum (*Jour. Nutr., 26 (1943), No. 1, pp. 1–19, illus. 5*).—A solid basal diet very low in manganese (0.2–0.3 μg, per gram) was devised which, when supplemented with Mn, supported much better growth than any previous Mn-low diet. Female rats started on this Mn-low diet at weaning produced nonviable young but were able to raise foster stock or control young. These females exhibited no abnormal behavior toward their young and no disturbance in estrous cycle. Deficient mice likewise gave birth to nonviable young. Although the first-generation rats showed no decrease in growth on the Mn-deficient diet, yet deficient offspring, particularly the males of stock females placed on the deficient diet late in pregnancy, were inferior in growth to litter mates given Mn. Increasing the Ca and P in the Mn-low basal ration also resulted in a marked decrease in growth of the first-generation males. The deficient males were sterile. The young of the deficient females, aside from being subnormal in weight, showed an ataxia, incoordination, and loss of equilibrium. The production of inferior young and poor growth of the female and sterility and poor growth of the male could be reversed by administration of Mn. Livers of the deficient rats showed in vitro a markedly lower arginase activity than livers of the control rats. The effects of Mn deficiency observed in this study are discussed in connection with such observations reported by others.

Dermatitis on a synthetic ration adequate for growth and reproduction in the rat, B. H. Ershoff (*Soc. Expt. Biol. and Med. Proc., 52 (1943), No. 1, pp. 41–43, illus. 2*).—A synthetic ration composed of sucrose, casein, cystine, salts, and supplements of vitamins A and D, the various B vitamins (including pantothenic acid and pyridoxine), and α-tocopherol and corn oil supported very good growth and normal reproduction but produced a specific tail dermatitis (described) which was distinct from that observed in pantothenic acid, pyridoxine, and essential fatty acid deficiency. It is suggested that some dietary factor or factors other than the above is involved in the maintenance of normal tail epithelium.

Carrot diet and susceptibility to acute "anoxia," D. Nelson, S. Goetzl, S. Robins, and A. C. Ivy (*Soc. Expt. Biol. and Med. Proc., 52 (1943), No. 1, pp.*

1–2).—The experiments were designed to determine the effect of ingested carrots in retarding or hastening the death of animals exposed to a lethal degree of oxygen deficiency. The behavior of 107 rats fed nothing but carrots for 10 days was compared with that of 107 rats fed a stock diet. When the animals, in a decompression chamber, were subjected to a pressure of 225.6 mm. (simulated altitude of 30,000 ft.) attained in 15 min. and maintained for 2 hr. and returned to ground level in 45 min., 79 percent of the carrot-fed animals survived the exposure to high altitude, whereas only 21 percent of the controls survived. The animals on the carrot diet lost 1 percent of their body weight per day. Factors responsible for the protective effect of the carrot diet are being investigated.

Vitellin, casein, liver, and muscle tissue as sources of phosphorus for the rachitic rat, R. Bunkfeldt and H. Steenbock. (Wis. Expt. Sta.). (*Jour. Nutr., 25 (1943), No. 4, pp. 309–317*).—The availability for bone calcification of the phosphorus of ovovitellin, casein, proteins of pork liver and loin, and ovophospholipide—all prepared and purified by methods described—was determined by the procedure previously used in determining the availability of the phosphorus of phytic acid, yeast nucleic acid, and soybean phosphatides (E. S. R., 86, p. 125). The phosphorus of the ovovitellin appeared to be present in a different form from that occurring in casein, since it took more than twice as much vitellin phosphorus as inorganic phosphorus (mono- and dicalcium phosphates) at a Ca : P ratio of 3 : 1 to produce the same degree of calcification, while the casein phosphorus was found equal in value to the inorganic phosphorus. The phosphorus from pork loin was less available than inorganic phosphorus, but not to the same degree as vitellin phosphorus. Pork liver and ovophospholipide phosphorus approximated inorganic phosphorus in value.

Experiment station research on the vitamin content and the preservation of foods, G. Adams and S. L. Smith (*U. S. Dept. Agr., Misc. Pub. 536 (1944), pp. 88, illus. 1*).—This report, based upon experiment station studies reported in the period 1941 to as late as July 1943, is concerned with variations in the nutritive value of foods due to such factors as natural variations, common storage, freezing and frozen storage, dehydration, brining and salting, canning, cooking, and milling. Data accruing in these studies on the vitamin content of foods are summarized in separate tables for fruit and fruit products; vegetables and vegetable products; cereals and cereal products; meat and meat organs, fish, eggs, and milk; and miscellaneous foods. Another section of the report indicates the scope of experiment station contributions in regard to the preservation of foods by freezing, dehydration, canning, and other methods. One hundred and sixty-seven literature references are cited.

Historical development of microbiological methods in vitamin research, M. Sandford (*Nature [London], 152 (1943), No. 3857, pp. 374–376*).—This review is accompanied by 58 references to the literature.

The vitamin A, vitamin B_1 (thiamin), vitamin C (ascorbic acid), and riboflavin content of common foods: A summary of "representative" values, H. E. Munsell (*Milbank Mem. Fund Quart., 21 (1943), No. 1, pp. 102–108*).—The table of vitamin values presented here represents a complete revision of an earlier table (E. S. R., 84, p. 846) and is based on a compilation of data published through July 1942. The major change involves expression of values for vitamin B_1, vitamin C, and riboflavin in terms of micrograms or milligrams instead of International Units.

Vitamins and their occurrence in foods (Vitaminas y su presencia en los alimentos), H. E. Munsell (*Puerto Rico Jour. Pub. Health and Trop. Med., 19 (1943), No. 2, pp. 256–325; Span., pp. 289–325*).—This review is adapted from an earlier report (E. S. R., 84, p. 846), with the table of vitamin values corresponding to the revised data noted above.

The vitamin A, B_1, and C values of home-dehydrated vegetables, M. C. Smith, E. Caldwell, and L. O. Burlinson (*Arizona Sta. Mimeog. Rpt. 57 (1944), pp. 12+*).—Progress notes for this study report findings concerning the losses of vitamin A, thiamine, and ascorbic acid occurring in vegetables dehydrated by the home method recommended by the (Arizona) Extension Service and noted briefly here. The dehydration losses, calculated from the data (moisture-free basis) obtained for the fresh and dehydrated samples, indicate losses of ascorbic acid of 35–81 percent in the green or leafy vegetables (beet greens, broccoli, green and red cabbages, chard, spinach, turnip greens), of 10 percent in banana squash, and of 25–100 percent in the root vegetables (beets, carrots, rutabagas, turnips, sweetpotatoes); corresponding losses for thiamine were 13–42, 29, and 8–18 percent; and for vitamin A, 0–34, 43, and from an apparent gain of 12 to a loss of 28 percent. Storage of the vegetables in sealed glass jars for 2 mo. resulted in but slight loss of either thiamine or ascorbic acid. Even after 4 mo. (December to May), tests for ascorbic acid showed but relatively slight losses. Storage for an additional 4 mo. over the summer season caused a large part of the ascorbic acid to be lost. The vitamin A, thiamine, and ascorbic acid values of common servings of the best lots of the vegetables analyzed in the study, both before and after they were dried, are summarized in tabular form.

Dental depigmentation in the rat, T. Moore (*Biochem. Jour., 37 (1943), No. 1, pp. 112–115*).—Whitening of the teeth was induced in rats kept on either a vitamin A- or a vitamin E-deficient diet. That the effect was due to the vitamin deficiency was indicated by the fact that color was restored by administration of the vitamins in sufficient dosage. A low dose of vitamin A, which was sufficient to restore rapid growth in rats previously deprived of this vitamin, was ineffective in restoring the normal brown color of the teeth.

The carotene content of tomatoes as influenced by various factors, G. H. Ellis and K. C. Hamner. (U. S. D. A.). (*Jour. Nutr., 25 (1943), No. 6, pp. 539–553, illus. 1*).—Carotene was determined in several thousand tomato fruits, most of which were analyzed individually. The determination was carried out on a diacetone and acetone extract of central transverse segments of the fruits, the pigments being extracted from this solution with petroleum ether and subjected to chromatographic separation on a Tswett column consisting of a mixture of magnesium oxide and diatomaceous earth. The lower band, containing chiefly β-carotene, was eluted with petroleum ether containing 4 percent ethanol, and the pigment was determined in a photoelectric colorimeter previously calibrated with β-carotene. Of several hundred ripe fruits of an inbred strain of the Bonny Best variety, there was little correlation between fruit size and carotene content. Large fruit was only slightly richer in carotene than small fruit. There was a greater concentration of carotene in the stem- than in the blossom-end of the ripe fruit. In these trials, tomato plants growing in sand cultures in 87 different solutions of macronutrient elements (E. S. R., 88, p. 560) produced only slight variations in the carotene content of the fruit, even though growth and fruitfulness of the plants were greatly affected. There were indications that increasing the supply of nitrate in the nutrient solution resulted in increasing the carotene content of the fruit, but the magnitude of variations in carotene was not great. Differences in carotene content were correlated with varietal differences, but the varieties used in these trials were large-fruited commercial forms of the same color type and did not differ greatly.

In other trials with the Bonny Best variety, ripe fruits were produced on plants grown at different locations, in different soils, under artificial illumination, in summer (outside and in the greenhouse), and during the winter (in

the greenhouse). The lowest values for carotene content (averages in different trials, 3.6–4.0 μg. per gram) were obtained for fruit produced in the greenhouse. None of the other variations in environment seemed to affect carotene content very much when the fruits were allowed to ripen on the plant. Tomatoes which were picked green and allowed to ripen in storage contained in different lots an average of 1.7–3.0 μg. of carotene per gram; these were much lower in carotene than vine-ripened fruit, which contained 4.0±0.60 μg. per gram. Ripe fruit obtained from a local market during the winter contained about half as much carotene as might be expected from the vine-ripened fruit in summer.

The effect of concentration on the absorption of vitamin A, A. G. Reifman, L. F. Hallman, and H. J. Deuel, Jr. (*Jour. Nutr., 26 (1943), No. 1, pp. 33–42*).—Rats from a stock colony were placed on a vitamin A-low diet for 6 days, fasted for 48 hr., and then given vitamin A solutions in concentrations of 100, 1,000, 10,000, 100,000, and 1,000,000 International Units per gram by stomach tube in amounts of 300 mg. of the solution per 100 cm.^{2} of surface area. The three lowest concentrations were prepared by dilution of shark-liver oil of 110,000 I. U. potency with commercial hydrogenated cottonseed oil, the next with undiluted shark-liver oil, and the highest with an undiluted concentrate. At the end of 3 hr. the gastrointestinal tracts were removed for analysis of remaining vitamin A. Tests were also carried out in which after similar doses of vitamin A the gastrointestinal tracts were removed and incubated to determine possible bacterial destruction of the vitamin.

The rate of absorption was found to be proportional to the concentration of the vitamin administered, the average absorption per 100 cm.^{2} per hour being 4.2 to 6.5 I. U., 28.5, 369, 2,108, and 10,140 for the varying levels fed from lowest to highest. No relationship was found between the rate of absorption of neutral fat and vitamin A, and there was no destruction of the vitamin by intestinal bacteria over a 3-hr. period.

Spectrophotometric studies of the storage of vitamin A in the body, R. W. Little, A. W. Thomas, and H. C. Sherman (*Jour. Biol. Chem., 148 (1943), No. 2, pp. 441–443*).—In this investigation a spectrophotometric method involving the technic of destructive irradiation was employed in studying the concentration of vitamin A in the liver tissue of rats maintained to the ages of 30, 90 and 150 days on three milk-wheat diets containing 3, 6, and 12 International Units of vitamin A per gram through supplementation with cod-liver oil.

With increased concentration of vitamin A in the diet, the content of the vitamin in the liver at each of the three periods increased, but this increase was much more marked the longer the feeding period. At 30 days the average values were 5.1±0.7, 13±2, and 70±14 I. U. per gram of fresh tissue and at 150 days 5.1±1.1, 42±17, and 325±40. "Thus, whether or not the age changes at the lowest intake level be regarded as significant, the data as a whole show clearly that increase of the vitamin A value of the diet to twofold and fourfold the lowest level here studied enables the body to store in the liver higher concentrations of vitamin A and to continue the increase of these concentrations to higher ages."

Biological value of spectro vitamin A in liver, G. S. Fraps and W. W. Meinke. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 3, pp. 399–404*).—This work repeated an earlier study (E. S. R., 88, p. 731), using instead of the liver extracts previously employed the livers themselves, these being kept frozen until fed to the rats in order to preserve the vitamin A content. "Spectro vitamin A, carotene, and International Units of vitamin A were determined in 24 tests on 13 samples of beef livers and 12 tests on 8 samples of pork livers. The vitamin A potency of 1 μg. of spectro vitamin A averaged 3.0

I. U. for beef livers containing more than 43 μg. per gram of spectro vitamin A, 0.7 I. U. for those containing 1.5–2.7 μg., and 1.2 for pork liver containing 19.5–78.3 μg. of spectro vitamin A per gram.

"The International or U. S. P. units of vitamin A in liver can be calculated by the formula, $U=A\ S+1.7\ C$, in which U is the International Units per gram, S is the micrograms of spectro vitamin A per gram, C the micrograms of carotene per gram, and A is 3.0 for beef livers containing more than 43 μg. of spectro vitamin A per gram, 1.5 for those containing 3–43 μg., and 0.7 for those containing less than 3 μg. The value of A is 1.2 for pork livers containing less than 80 μg. per gram, and 3.0 for those containing more than that quantity. Livers contain compounds that do not have vitamin A activity, but they are determined as spectro vitamin A."

Studies of the nutritional problem of Puerto Rico.—I, Vitamin A deficiency in relation to dark adaptation and ocular manifestations (Estudios del problema de la nutrición en Puerto Rico.—I, Deficiencia de vitamina A en relación con la visión en la oscuridad y manifestaciones oculares), R. M. Suárez (*Puerto Rico Jour. Pub. Health and Trop. Med., 19 (1943), No. 1, pp. 62–80, illus. 6; Span., pp. 81–94*).—This report is prefaced by a review of the conflicting literature on the correlation between dark adaptation and vitamin A deficiency and a discussion of the nutritional problems in Puerto Rico, particularly with respect to the consumption of foods rich in carotene and vitamin A, including references to Puerto Rico University Experiment Station Bulletins 55 (E. S. R., 84, p. 833) and 59 (E. S. R., 85, p. 849) and reports by Cook et al. (E. S. R., 86, p. 414) and Cook and Axtmayer (E. S. R., 70, p. 725). Biophotometric studies were conducted on 267 subjects, of whom 82 were patients in two institutions and 185 apparently healthy persons including 76 professional, technical, and secretarial personnel from the same institution and 109 girls from a charity school.

The normal curve for the biophotometer used started at 55 and showed a gradual rise up to 100 at the end of 10 min. Only two cases of the entire series reached this level, with six others approximating it. All of these showed slight improvement following massive oral doses of vitamin A. The average or composite curve for 46 apparently healthy subjects at one of the institutions extended from 42 to 72, for 31 individuals from the other institutions from 54 to 93, and for the girls from the charity school from 36 to 67. Six patients with sprue gave an average curve of from 26 to 53, and 75 patients at the U. S. Veterans' Hospital from 28 to 59. Several instances of improvement following the administration of vitamin A are noted. Gross examination of the eyes for conjunctival changes attributed to vitamin A deficiency was made on 116 ambulatory patients, most of whom belonged to the upper economic group and none of whom complained of any type of ocular symptoms. Of these, 13 adults and 10 children had normal conjunctivae and all of the others showed gross evidence of vitamin A deficiency, including increased vascularity in 5, prexerosis in 19, and Bitot's spots in 69. Two of this group also showed considerable conjunctival pigmentation.

The author concludes that there exists in the population of Puerto Rico "a chronic, latent, and subclinical stage of vitamin A subnutrition which may exhibit epidemic characteristics under intercurrent infection and the stress of existing economic and nutritional difficulties, unless measures are adopted for its control and prevention." The condition is attributed in part to the preference of the people for a rice and bean diet. Suggestions for improving the situation include utilization of shark-liver oil to provide the necessary supplement of vitamin A, a campaign to raise and consume more green and leafy vegetables, the establishment by the Government of a cafeteria to furnish at least

one meal of high nutritional value to all industrial and agricultural workers, the distribution of pamphlets on nutrition, and priority for shipping space for certain foods, including dairy products.

New members of the B complex: Their nutritional significance, C. A. Elvehjem. (Univ. Wis.). (*Chem. and Engin. News, 21 (1943), No. 11, pp. 853–857*).—This is the Willard Gibbs medalist address delivered upon presentation of this award by the Chicago Section of the American Chemical Society, May 20, 1943.

Relationship between vitamin B complex intake and work output in trained subjects, C. J. Barborka, E. E. Foltz, and A. C. Ivy (*Jour. Amer. Med. Assoc., 122 (1943), No. 11, pp. 717–720, illus. 5*).—Four medical students served as subjects in this long-time investigation. A period of 9 mo. to a year on a controlled adequate diet preceded a period of 82 days on a diet furnishing about one-third of the quantity of thiamine and riboflavin in the recommended daily allowances of the National Research Council. During the last 3 weeks of this period, half of the fat calories of the diet were replaced by isocaloric amounts of carbohydrate. Then followed 4 weeks on the deficient diet supplemented with a yeast concentrate given in a lemon and tomato juice mix. The work was done three times each week on an electrodynamic brake bicycle ergometer at the rate of 1,235 kgm. a minute with a pedaling rate of 54 revolutions a minute, the subjects working to complete fatigue, resting 10 min., and again working to complete fatigue.

During the period on the deficient diet, the subjects developed no objective physical signs of a deficiency of the B complex but showed irritability, easy fatigability, lack of "pep," anorexia, and increased leg pains during the work period. The urinary excretion of thiamine and riboflavin fell to low levels, but the blood thiamine remained constant. Absolute values for blood pyruvic acid remained constant, but values calculated with reference to calories of work done increased by more than 50 percent as the deficiency progressed. The work output rose to a plateau during the first 3 or 4 mo. of the preliminary period of training on an adequate diet and remained fairly constant until shortly after the deficient diet was begun when it fell definitely, rising again after the diet had been supplemented with yeast to the level of the adequate diet and in one case to an even higher level.

Effect of large amounts of single vitamins of the B group upon rats deficient in other vitamins, K. Unna and J. D. Clark (*Amer. Jour. Med. Sci., 204 (1942), No. 3, pp. 364–371, illus. 3*).—The general plan of this investigation, which was carried out on 920 male albino rats, was to place the rats at 3 weeks of age in groups of 20 on highly purified diets deficient either in the entire vitamin B complex or in individual factors, with the animals of each group receiving by stomach tube a daily supplement of one vitamin in excessive amounts—1 mg. of either thiamine, riboflavin, or pyridoxine or 10 mg. of either nicotinamide or calcium pantothenate. The animals were kept in individual cages for 100 days and their weights and symptoms recorded at frequent intervals. At the end of the period, autopsies were performed.

The daily feeding of large amounts of the single vitamins had no significant effect on the growth rate of the animals, the severity of the lesions characteristic of the specific deficiency, or the mortality.

The biological assay of crystalline vitamin B_1, aneurine hydrochloride, by the rat growth method, E. A. G. Shrimpton (*Quart. Jour. Pharm. and Pharmacol., 16 (1943), No. 2, pp. 86–101*).—Collaborative tests to compare the potency of the old international standard vitamin B_1—the standard acid clay adsorbate—with synthetic crystalline thiamine hydrochloride involved the use of several methods, including rat growth, rat bradycardia, rat curative, and

pigeon curative methods. This work was fully presented by Macrae (E. S. R., 91, p. 98). The present paper, limited to consideration of the rat growth method, statistically examines the results of the nine cooperating laboratories in detail. The mean of the results from the nine laboratories established 3.172 μg, as the weight of crystalline thiamine equivalent to 1 International Unit. The variances of response of individual rats were essentially homogeneous for a given laboratory and did not differ from the standard and test preparations. Differences in technic, such as variety of rats and duration of test, appeared to influence the magnitude of the response variance. A linear dosage-response relation was found to hold between the response, the increase in weight over the period of the test, and the logarithm of the dose. The slope of the standard did not differ from that of the test in any one laboratory, but the combined slopes varied from laboratory to laboratory. The errors of assay appeared to be influenced by differences of technic. More accurate assays for the same number of animals may be obtained by a suitable choice of experimental rats, duration of test, and basal diet, among other factors.

"The average over-all estimate of the standard error for a single assay, using 20 rats, 10 for standard and 10 for test, is 0.0428, and the limits of error are 77.6–128.9 percent for P = 0.99, 82.4–121.3 percent for P = 0.95. In view of heterogeneity of variance and slope between laboratories, it is better, however, to estimate the error of assay from the evidence supplied by the data rather than to rely upon an average estimate."

Biotin content of meat and meat products, B. S. Schweigert, E. Nielsen, J. M. McIntire, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 1, pp. 65–71*).—Biotin liberated from the meats by treating with 6 N H_2SO_4 and autoclaving for 2 hr. at 15 lb. pressure was determined by a modification of the *Lactobacillus casei* method of Shull, Hutchings, and Peterson (E. S. R., 87, p. 626). Some of the analyses were conducted on dried samples freed of visible fat, these having been previously analyzed for vitamins as reported by Waisman and Elvehjem (E. S. R., 86, p. 560). Others analyzed as fresh meats before or after cooking or other treatment included samples previously mentioned by McIntire et al. (E. S. R., 90, p. 565) and those utilized in the study noted below. Kidney and liver were the best sources of biotin, pork and beef kidney, for example, containing, respectively, 6,230 and 4,050 mμg. of biotin per gram of dry tissue, and lamb, beef, veal, and pork livers containing, respectively, 4,375, 3,530, 2,820, and 2,840 mμg. per gram dry tissue. Heart, pancreas, and light and dark chicken meat with values from 358 to 815 mμg. per gram (dry basis) were good sources. Beef spleen, lung, brain, and tongue contained about the same amount of biotin as pork, beef, veal, and lamb muscle meats, the latter group containing from 95 to 288 mμg. per gram on the dry basis and 21 to 77 mμg. per gram on the fresh basis. An average of 77 percent of the biotin was retained in the meat alone after cooking, and an average of 80 percent was retained in the meat plus drippings after cooking. From 1 to 5 percent of the biotin present in the original meat was recovered in the drippings after cooking. The meats were cooked by the methods employed by McIntire et al.

The retention of vitamins in meats during storage, curing, and cooking, B. S. Schweigert, J. M. McIntire, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 1, pp. 73–80*).—Thiamine, nicotinic acid, and riboflavin were determined by methods noted in fresh, fresh stored, and cured hams before and after cooking. The cooking was carried out under standard conditions without seasoning, and the drippings and fryings were retained for vitamin analyses. Average retention during storage was 92 percent for the thiamine and nicotinic acid and 85 percent for the riboflavin. The retention in curing was found to be 73 percent for the thiamine, 84 for the nicotinic acid, and 92

percent for the riboflavin. The average retention in the meat alone after roasting was 58 percent for thiamine, 79 for nicotinic acid, and 74 for riboflavin; after frying, 86 for thiamine, 85 for nicotinic acid, and 77 percent for riboflavin. The average total retention in the meat plus drippings after roasting was 70 percent for thiamine, 96 for nicotinic acid, and 84 for riboflavin; after frying, 92 for thiamine, 96 for nicotinic acid, and 86 percent for riboflavin. The over-all retention of the vitamins from fresh stored to cured fried samples agreed very well with the vitamin retention during curing and frying. From 10 to 15 percent of each of the vitamins was found in the drippings from roasting and frying. A higher retention of thiamine in the meat alone was found after frying, as compared to roasting, braising, and broiling.

The structure and estimation of natural products functionally related to nicotinic acid, C. A. ELVEHJEM and L. J. TEPLY. (Univ. Wis.). (*Chem. Rev., 33 (1943), No. 3, pp. 185–208*).—"The authors have attempted to list in this review most of the compounds chemically related to nicotinic acid and to indicate the biological activity of each compound. The importance of the active compounds in animal and bacterial metabolism is outlined. A summary is given of the chemical, physical, biological, and microbiological methods available for the determination of nicotinic acid, nicotinamide, and coenzymes I and II. The application of these methods in nutritional and biological studies is discussed briefly." The bibliography contains 164 references.

The effect of aromatic hydrocarbons on growth. The reversible inhibition of pantothenic acid by sulfapyridine, H. D. WEST, N. C. JEFFERSON, and R. E. RIVERA (*Jour. Nutr., 25 (1943), No. 5, pp. 471–477, illus. 1*).—In young rats on a synthetic diet low in casein but containing sulfapyridine alone or together with *l*-cystine or *dl*-methionine, symptoms resembling chiefly those of pantothenic acid deficiency were produced and were reversed by supplementation with calcium pantothenate. Sulfapyridine alone retarded the growth rate of rats on a low casein diet, the condition being relieved by either cystine or *dl*-methionine. It would thus appear "that in these experiments two growth-inhibiting factors are at work, viz, a direct effect due to sulfapyridine relieved by *l*-cystine or *dl*-methionine, and an indirect effect due to sulfapyridine inhibition of pantothenic acid."

The younger rats showed the most acute symptoms, indicating a more active metabolism of pantothenic acid during the stage of rapid growth. This is in line with the observation of Unna and Richards (E. S. R., 88, p. 712), as is also the observation that the growth curves for the diets supplemented with sulfapyridine show a general rate increase at the age, about 6 weeks, at which pantothenic acid requirements decrease.

The rôle of riboflavin in blood regeneration, H. SPECTOR, A. R. MAASS, L. MICHAUD, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 150 (1943), No. 1, pp. 75–87, illus. 4*).—The rate of hemoglobin regeneration was followed in dogs, with and without phlebotomy, receiving various levels of riboflavin in addition to their highly purified synthetic ration, supplemented only with the crystalline B vitamins exclusive of riboflavin. At least 30γ of riboflavin per kilogram of body weight was necessary for good food consumption and growth in young dogs; in adult dogs, 15γ was apparently sufficient for good food consumption and maintenance of weight. These levels of riboflavin were also necessary for good hemoglobin production and recovery from the anemia which developed in the dogs on the synthetic ration without riboflavin. This anemia was generally mild, but became severe upon slight bleeding. In growing dogs under the strain of phlebotomy, the 30γ of riboflavin was not sufficient to permit replacement of the blood removed. "In the absence of riboflavin a microcytic, hypochromic type of anemia was produced. During

phlebotomy with riboflavin feeding there was a normocytic, hypochromic type of anemia. Riboflavin plays a role in determining the size of new cells."

Effect of storage on thiamin content and on development of rancidity in wheat germ, J. A. PEARCE (*Canad. Jour. Res., 21 (1943), No. 2, Sect. C, pp. 57–65*).—Wheat germ samples with adjusted moisture contents varying between 8.0 and 26.5 percent were stored in air in sealed tins at —40°, —15°, 0°, 15°, 30°, 60°, and 75° F., and examined at intervals up to 18 weeks for development of rancidity as indicated by organoleptic tests and by peroxide oxygen values in the oil extracted from the germ. Thiamine content was determined at intervals up to 26 weeks in samples stored at 60°. Thiamine was determined in an acid (1 percent HCl) extract of the germ by a thiochrome method outlined briefly. The appearance of organoleptic spoilage appeared to coincide with the termination of the induction period in oxidative rancidity development. Decreased moisture content appreciably retarded the onset of oxidation rancidity during storage. At temperatures above 30°, however, the wheat germ deteriorated very rapidly. At a temperature as low as —40° the wheat germ stored for even a relatively short time suffered changes that seriously impaired its keeping quality when subsequently removed to higher temperatures. Both packing in nitrogen and compressing into blocks lengthened storage life. The thiamine content appeared not to change with storage, the values for the samples analyzed from time to time ranging between 14.2γ and 15.8γ per gram. Wheat-germ oil expressed by pressure became rancid more rapidly than oil extracted with petroleum ether. Increase in temperature markedly decreased the storage life of the oil. Some evidence was obtained to indicate that protein hydrolysis may be a more important factor than fat spoilage in the deterioration of wheat germ.

Is breast milk adequate in meeting the thiamine requirement of infants? E. M. KNOTT, S. C. KLEIGER, and F. W. SCHLUTZ (*Jour. Ped., 22 (1943), No. 1, pp. 43–49, illus. 1*).—In this reinvestigation of the question of adequacy of breast milk to meet the thiamine requirement of infants (E. S. R., 89, p. 772), more recent data on the thiamine content of breast milk (E. S. R., 90, p. 567) in which higher values were attained than in earlier studies were considered with relation to the apparent need of supplementary feedings, and analyses for thiamine and pyrimidine were made of the urine of infants living exclusively on breast milk, on breast milk with supplementary feedings, or on evaporated milk.

Nine infants receiving unsupplemented breast milk with a thiamine content of about 20 μg. of thiamine per 100 cc. and consuming about 150 to 210 μg. of the vitamin daily, depending upon their size, excreted an average of about 3 μg. of thiamine and 9 μg. of pyrimidine during the first 4 hr. and 6.5 and 8.4 μg., respectively, during the second 4 hr. One 22-week-old infant on unsupplemented breast milk containing about 23.5 μg. of thiamine per 100 cc. (amounting to a daily intake of approximately 325 μg.) excreted 37.1 μg. of thiamine after a test dose as compared with 3.2 μg. before the test dose. Eight infants whose mothers received thiamine supplements or who had been given evaporated milk formulas excreted much larger amounts of thiamine and pyrimidine than the unsupplemented breast-fed infants.

From these findings it is concluded that young infants have a minimum thiamine requirement of approximately 200 μg. daily which can just be met on breast milk containing at least 20 μg. of thiamine per 100 cc. "The suggestion is made that 40 μg. of thiamine per kilogram may be a practical standard to cover the ordinary needs of the young infant."

The authors had the technical assistance of G. Collins.

A new principle for the production of thiamin-deficient diets and for the biological assay of thiamin in foodstuffs, J. A. DE LOUREIRO (*Jour. Hyg.*

[*London*], *43* (*1943*), *No. 3, pp. 217–218*).—It is recommended that yeast for use in thiamine-deficient diets be treated with SO_2 rather than autoclaved, since the action of the SO_2 is confined largely to destruction of the thiamine without inactivation of other constituents. In consequence, the dietary proportion of sulfite yeast (supplemented with thiamine) needed for optimal growth is no greater than the percentage of fresh yeast, whereas from two to three times as much autoclaved yeast must be used. If the casein of the basal diet (casein 182, tapioca 67, SO_2 yeast 8, salts 5, cod-liver oil 2) is also treated with SO_2 a more acute deficiency, which causes death from hypothermia and bradycardia but with almost no neurological symptoms, is produced. The symptoms are due to thiamine deficiency exclusively, since administration of the vitamin effects a dramatic cure. The use of this basal diet is recommended for the biological assay of thiamine in foodstuffs.

Excretion of thiamine, riboflavin, niacin, and pantothenic acid in human sweat, T. Cornbleet, E. R. Kirch, and O. Bergeim (*Jour. Amer. Med. Assoc., 122* (*1943*) *No. 7, pp. 426–429*).—For this study, in which the authors had the technical assistance of J. D. Solomon, the subjects, normal men on mixed diets, were encased up to their necks in rubber bags and sweated in a cabinet provided with incandescent lamps which furnished sufficient heat to collect from 100 to 200 cc. of sweat in 20 to 30 min. In most cases, the subjects were given a shower bath about 45 min. before sweating was induced and in some instances more than one sample of sweat was taken. In a few instances, the diet was supplemented with additional vitamins either by mouth or injection. The data are reported without reference to length of period of collection.

The thiamine values varied from less than 0.06 to 0.60 μg. per cubic centimeter of sweat and averaged 0.2 μg., riboflavin 0.03 to 0.30 with an average of 0.15, pantothenic acid 0.12 to 0.80 with an average of 0.34, and nicotinic acid 0.1 to 0.46 with an average of 0.23 μg. per cubic centimeter. It is suggested that all of these values may be somewhat high owing to the difficulty of avoiding entirely concentration of the sweat due to evaporation on the skin surface. Values of thiamine 150, riboflavin 120, pantothenic acid 300, and nicotinic acid 200 μg. per liter as general averages correspond for thiamine to about 5 percent of the intake on a good diet, for riboflavin and pantothenic acid about 3 percent, and nicotinic acid about 0.5 percent of the intake. For average American diets, it is thought that the values would be more nearly 10 percent for thiamine, 5 percent for riboflavin, and 1 percent for nicotinic acid. "The excretion of such amounts of these vitamins cannot be said to be negligible from the physiologic standpoint although perhaps becoming of real importance only in case of rather profuse sweating or on diets low in these vitamins."

No increase of riboflavin was noted in sweat after ingestion or injection of large doses of this vitamin, nor were there any significant changes noted in the studies on niacin and pantothenic acid, while results for thiamine were somewhat irregular.

The excretion of ascorbic acid, thiamine, riboflavin, and pantothenic acid in sweat, D. M. Tennent and R. H. Silber (*Jour. Biol. Chem., 148* (*1943*), *No. 2, pp. 359–364*).—Ascorbic acid (and in some cases dehydroascorbic acid), thiamine, riboflavin, and pantothenic acid were determined in thermal sweat and exercise sweat in young male volunteer subjects with and without previous administration of massive doses of the vitamin. The sweating was induced in a specially built insulated room with controlled temperature and humidity. For the collection of thermal sweat, the temperature of the room was kept at 41.7° to 43.3° C. and the relative humidity at 60 to 70 percent, and the sweat was collected in stainless steel pans on which the subjects stood. The exercise consisted in sawing wood at a temperature of 31° to 34° and a relative humidity of 80 to 85 percent, and the sweat was collected by continuous sponging of the

entire body with cellulose sponges and squeezing it into two amber bottles, one of which contained 10 cc. of N sulfuric acid for ascorbic acid and thiamine determinations and the other toluene for pantothenic acid and riboflavin. At the end of an hour the collection was stopped and the urine excreted during the time was taken for analysis.

No ascorbic acid was found in any of the sweat samples, but dehydroascorbic acid was found in thermal sweat from two Negro subjects who had not been given test doses and in exercise sweat from three subjects who had received massive doses of ascorbic acid. The average level of dehydroascorbic acid for all of these subjects amounted to only 0.23 mg. The amounts of thiamine excreted were insignificant, the average hourly losses amounting to only 0.5 μg. from the undosed and 1.4 μg. from the dosed subjects. Corresponding values for riboflaven were 10 and 10 μg. and for pantothenic acid 24 and 50 μg., respectively. Dosing increased the excretion of the vitamins in the urine to a much greater extent. Dosed subjects excreted 60, 50, and 10 times as much thiamine, riboflavin, and pantothenic acid, respectively, as subjects not given extra vitamins although the collection period did not include the peak of urinary excretion.

It is concluded that excessive sweating is not likely to induce deficiency in ascorbic acid, thiamine, or riboflavin if the dietary intake of these vitamins is adequate according to accepted standards.

An evaluation of the blood and urinary thiamine determinations in vitamin B_1 subnutrition, R. A. Benson, C. M. Witzberger, and L. B. Slobody (*Jour. Ped., 23 (1943), No. 4, pp. 437–445*).—Using the same procedures as in earlier studies on the urinary excretion of thiamine in normal children (E. S. R., 86, p. 868) and in children in acute, chronic, and convalescent stages of illness (E. S. R., 88, p. 710) and on the blood level of thiamine in healthy children (E. S. R., 91, p. 100), the authors determined the daily urinary thiamine excretion for 1 week and the thiamine content of the blood four times during the week of 121 children suspected of having thiamine subnutrition. On the basis of the urinary thiamine excretion the subjects were classified into four groups. Group 1 included 55 children who met the three requirements of thiamine tissue saturation of thiamine intake of more than 900 μg., thiamine excretion of over 150 μg., and excretion of at least 20 percent of ingested thiamine. Group 2 consisted of 29 children with a thiamine intake of 600 to 900 μg. and excretion of 100 to 150 μg., group 3 of 15 children with a thiamine intake of 500 to 700 μg., and excretion of 70 to 100 μg., and group 4 of 22 children with a thiamine intake of 243 to 600 μg. and excretion of 23 to 69 μg. The blood thiamine values of these groups appeared to bear no relation to intake or excretion. The ranges and means for the four groups, respectively, were 5.0, 13.7, and 8.2±1.0 μg. per 100 cc.; 5.2, 12.4, and 8.3±1.0; 4.5, 10.7, and 8.0±1.3; and 5.5, 13.9, and 8.0±1.1 μg. per 100 cc.

From these findings the authors concluded that the determination of thiamine in the blood is of no value in the diagnosis of vitamin B^1 subnutrition, but that urinary excretion studies are satisfactory for this purpose. In the method recommended as most satisfactory at the present time, the individual to be studied is given a prescribed diet containing an adequate amount of thiamine (450 μg. per 1,000 calories). The 24-hr. urine is collected on 2 succeeding days and its content of thiamine determined. Under these conditions an average thiamine excretion of 150 μg. or more daily, or 20 percent or more of the ingested dose, is considered to indicate tissue saturation.

Der Vitamin C-Gehalt italienischer Orangen und daraus hergestellter Pulpen [The vitamin C content of Italian oranges and orange pulps], H. M. Rauen, M. Devescovi, and N. Magnani (*Ztschr. Untersuch. Lebensmtl., 85 (1943), No. 3, pp. 257–266*).—Ascorbic acid and total vitamin C, the latter

estimated after H_2S treatment, were determined in several kinds of Italian oranges analyzed in the fresh state and after preservation in SO_2 solution (0.15 percent). Ascorbic acid in the fruit flesh of the six samples varied from 13.5 to 47.8 mg. per 100 gm.; in the white portion of the skin, 27.0 to 89.7 mg.; and in the yellow part of the skin, 29.9 to 164.6 mg. per 100 gm. Corresponding values for total vitamin C were 44.9 to 73.2, 86.7 to 194.5, and 175.5 to 292.5 mg. per 100 gm. Analyses of samples held in SO_2 for 3-week and 2-mo. intervals and of various samples held under commercial conditions showed that the fruit pulp retained a large proportion of its ascorbic acid in this preservation process, but that the orange skin, particularly if finely chopped, lost a large amount of its ascorbic acid. Other preservatives (0.15 percent benzoic acid, 0.25 formic acid, and 0.15 percent "Abiol"=methyl ester of *p*-oxybenzoic acid) were much less effective than the SO_2 in preserving the vitamin. A powdered orange-peel product, prepared by drying orange peel in a vegetable dehydrator and pulverizing the dried material, contained 292.5 mg. ascorbic acid and 293.2 mg. total vitamin C per 100 gm. The values were somewhat lower for a similar product prepared from the peel of oranges preserved in SO_2.

The vitamin C values of vegetables after institutional preparation for consumption by the Army and Navy training groups at the University of Arizona, M. C. Smith, E. Caldwell, W. Ross, and M. A. Wood (*Arizona Sta. Mimeog. Rpt. 59 (1944), pp. 17+*).—These progress notes on a study conducted as part of the national cooperative project on the conservation of the nutritive value of foods report the findings of the vitamin C values of vegetables in the raw state and after preparation for consumption by the Army and Navy training groups at the University of Arizona. Calculations from these data, obtained for a large number of samples of each vegetable studied, indicated approximate cooking losses of ascorbic acid as follows: Broccoli 48 percent; cauliflower 38; green cabbage 37; "yams" [sweetpotatoes] 22; Irish potatoes, 33 steamed in jackets, 49 baked, 85 mashed; spinach 59; and banana squash, mashed, 38 percent. Fresh raw salads prepared from shredded vegetables and vegetable combinations and sampled after holding about 3 hr. contained from 3 mg. of ascorbic acid per 100 gm. for the head lettuce to 49 mg. per 100 gm. for cabbage slaw with green onions. The salads, except those containing raw cabbage, were relatively poor sources of vitamin C.

Ascorbic acid in dehydrated foods, L. W. Mapson (*Nature [London], 152 (1943), No. 3844, pp. 13–14*).—A preliminary report is presented of a highly specific method for determining ascorbic acid in the presence of reductonelike substances. The method involves the use of a 5 percent metaphosphoric acid extract of the food. One aliquot of the extract is adjusted to pH 0.6 or 1.2 (depending upon the presence or absence, respectively, of sulfide, sulfite, or SH compounds) by the addition of 50 percent sulfuric acid, then treated with formaldehyde to a concentration of 4 percent, and, after 8 minutes' standing at 20° C., titrated against indophenol dye. This titer, expressed as ascorbic acid, is the initial value for plotting graphically at 0 time. Another aliquot is adjusted to pH 2.0 by the addition of sodium citrate solution, and formaldehyde is added to a concentration of 8 percent. This solution is allowed to stand at 20°, and samples are withdrawn at intervals of 5–10 min. over a period of 90 min., immediately brought to a pH of 0.6 to arrest further action, and titrated against the dye within 5 min. These values are plotted as ordinates against the times as abscissas giving a curve which levels off. By this method any sulfhydryl compounds present are removed by condensation with the formaldehyde, but at the very acid reaction, at pH 0.6 or 1.2, ascorbic acid or reductones are not affected, and these, therefore, are measured in the first titration. In the second reaction, in the less acid solution (pH 2.0), the ascorbic acid is completely removed by

condensation, while the reductones are only slowly condensed. Extrapolation from the flat part of the curve back to the ordinate axis gives a measure of the reductones present. The difference between the initial indophenol titer and the reductone titer gives the ascorbic acid titer.

This method applied to dehydrated cabbage as freshly dehydrated and after storage indicated that reductones developed upon storage. Reductones may also develop in foods dried at unduly high temperatures.

Apparent vitamin C in certain foodstuffs, F. Wokes, J. G. Organ, J. Duncan, and F. C. Jacoby (*Nature [London], 152 (1943), No. 3844, pp. 14–15*).—This preliminary report offers evidence of the presence of nonspecific dye-reducing substances interfering with the determination of ascorbic acid in such foods as fruit sirups, cocoa, malt extract, dehydrated fruits and vegetables, cane and beet molasses, and a number of samples of beer. The apparent vitamin C differs from the reductones of Mapson (see above). True ascorbic acid in these preparations is removed by first determining the total apparent vitamin C by the potentiometric method of Harris et al. (E. S. R., 89, p. 626), then destroying the ascorbic acid by a 6-min. treatment with 6 percent formaldehyde at pH 4–5 at room temperature, and again determining the apparent ascorbic acid. The difference between the two results indicates the true ascorbic acid. Apparent vitamin C has not been found in fresh fruits and vegetables.

Vitamins from rose hips, F. Wokes, E. H. Johnson, J. Duncan, J. G. Organ, and F. C. Jacoby (*Quart. Jour. Pharm. and Pharmacol., 16 (1943), No. 3, pp. 269–274, illus. 3*).—Prolonged storage of rose hip sirups at room temperature and in the refrigerator was found, in confirmation of previous results (E. S. R., 90, p. 280), to cause significant losses in the ascorbic acid content of these sirups. In prolonged storage at 37° C. ascorbic acid as determined by dye titration ceased to fall and even began to rise slightly. This behavior, also observed in other foods and food products, was found to be due to the production of substances other than ascorbic acid capable of reducing the dye. From freshly collected ripe hips, mainly of the varieties *Rosa canina* and *R. dumetorum*, aqueous extracts were prepared with care to prevent oxidation of the vitamin by oxidizing enzymes, and the extract rapidly evaporated to dryness in vacuo. The resulting golden brown powder contained only about 1 percent of moisture and from 1,000 to 1,400 (average 1,250) mg. of ascorbic acid per 100 gm. of the various lots prepared. These stable dried rose hip extracts were also found by biological and clinical tests to be a good source of vitamin P, comparable with hesperidin and other potent preparations. They also contained considerable amounts of carotene.

Spray-dried rose hip powder, V. L. S. Charley and A. Pollard (*Nature [London], 152 (1943), No. 3856, pp. 354–355*).—A thick pectinous extract obtained from the milled hips by boiling them with twice their weight of water for ½ hr. and removing the liquid by hydraulic pressure was concentrated to sp. gr. 1.095 and spray-dried on a semicommercial scale in a Kestner machine with an air-outlet temperature of 85°–90° C. The resulting smooth, free-flowing powder was of fine texture with a moisture content of 5.1 percent and an ascorbic acid content of 979 mg. per 100 gm. Not more than 3 percent of the ascorbic acid value was lost after storage for 3 mo. at room temperature in gas-packed cans. Ascorbic acid was determined by the method of Harris and Olliver (E. S. R., 89, p. 625).

Apparent vitamin C in walnuts, R. Melville, F. Wokes, and J. G. Organ (*Nature [London], 152 (1943), No. 3859, pp. 447–448*).—Twenty-one samples of 5 different species of walnuts grown on English soil were examined for their content of total and apparent vitamin C. The nuts ranged in weight from 2 to 40 gm. and included different stages of ripening up to those in which the shell

had become hard and woody. Apparent vitamin C was determined by three methods, including that of Mapson (see p. 228) and unpublished procedures. All three methods showed the presence of apparent vitamin C which constituted from 5 to 73 percent of the total ascorbic acid in the samples analyzed. The husk (fleshy mesocarp) of walnuts in the later stages of growth of the fruit contained a higher concentration of vitamin C than the shell (endocarp) and the tissues enclosed within it. The fully developed kernel contained very little vitamin C. Total vitamin C in *Juglans regia* samples averaged 2,070 mg. per 100 gm., but allowance for apparent vitamin C reduced the mean true value to about 1,470.

Vitamin C in walnuts, J. W. H. Lugg and R. A. Weller (*Nature [London], 152 (1943), No. 3859, p. 448*).—The epicarps of two varieties of ripe edible walnuts (*Juglanis regia*) were analyzed at the stage when the endocarp was very hard, the epidermis was beginning to show dark patches, and the epicarp was very juicy. The method of estimation made use of the reduction of the dye 2,6-dichlorophenolindophenol by ascorbic acid and of reactions of formaldehyde as a means of distinguishing ascorbic acid from a number of extraneous reducing substances. The metaphosphoric acid extracts of the epicarps were found to contain only small amounts of extraneous reducing substances, confirming the view that the great reducing capacity of the walnut is due very largely to the presence of ascorbic acid. Only small amounts of dehydroascorbic acid were found in the extracts. The concentration of ascorbic acid amounted to 3.86 and 8.75 mg. per gram of epicarp in the two varieties examined.

Ascorbic acid deficiency among Papago Indians, M. Pijoan, C. A. Elkin, and C. O. Eslinger (*Jour. Nutr., 25 (1943), No. 5, pp. 491–496*).—This paper describes briefly the food habits of the Papago Indians, who live in settlements extending along the frontier of Arizona and Sonora (Mexico), and presents a limited amount of data on the ascorbic acid content of the typical foods of the tribe and of the blood plasma of 28 school children from 6 to 15 yr. of age in two groups—one at a school where lunches are provided and the other in an isolated community. The plasma ascorbic acid value for one of the children was 0.66 mg. per 100 cc., for two others 0.528 mg., and for the rest from 0.264 to 0.396 mg. per 100 cc. No ascorbic acid was found in various types of uncooked and cooked beans, corn, peas, and dried cactus seeds, which are the principal foods in the Papago diet. Values for other foods, analyzed raw, were Sahuaro cactus fruit 3.52 mg., dried red chili 14.46, dried cactus buds (cholla) 1.48, spinach (pigweed) 3.72, wheat flour 2.7, and squash 2.75 mg. The same foods cooked for 20 min. in 2-gm. samples in 15 cc. of water gave the following values with the cooking water included: Sahuaro cactus fruit 1.76 mg., dried red chili 9.57, dried cactus buds 1.16, spinach (pigweed) 1.32, wheat flour 1.5, and squash 1.2 mg. Other foods consumed included bread with a value of 1.7 mg. and Sahuaro cactus fruit sirup with a value of 8.96 mg.

It is concluded that the ascorbic acid content of the diet never exceeds 15 mg. per person per day and averages only about 5 mg., and that ascorbic acid deficiency may be responsible for the bleeding of the gums which occurs in 70 percent of the Indians and pyorrhoea which is present in all of the older adults. Difficulties in improving the diets of these people in ascorbic acid are discussed on account of the absence in the Papago reservation of plants having a high ascorbic acid content. The use of green peppers and seed sprouts is suggested as the most promising means of increasing food sources of ascorbic acid.

The effect of graded doses of vitamin C upon the regeneration of bone in guinea pigs on a scorbutic diet, G. Bourne (*Jour. Physiol., 101 (1942), No. 3, pp. 327–336, illus. 6*).—Experiments conducted to determine the amount of vitamin C required to promote optimum regeneration of bone in the guinea pig

were conducted by a method previously described (E. S. R., 89, p. 776), using young male guinea pigs on a scorbutic diet but receiving varied doses of vitamin C. by subcutaneous injection. The effects of these injections on the regeneration of bone, as measured by the amount of trabeculae formed in 1 week in a hole bored in the femur, showed that 2 mg. of injected vitamin C were required daily to secure adequate regeneration of bone; less than 1 mg. seriously retarded regeneration. It is suggested that the corresponding doses to produce the same results in human beings may be 40 mg. and 20 mg. of vitamin C. In guinea pigs, pure synthetic vitamin C alone was able to promote bone regeneration.

Activation of pro-vitamin D_3 in the rat, E. GEIGER and S. LASSEN (*Soc. Expt. Biol. and Med. Proc., 52 (1943), No. 1, pp. 11–12*).—Tests with rats on a rachitogenic diet for 21 days showed that activated 7-dehydrocholesterol, whether given by mouth or subcutaneously, effected pronounced healing as judged by line-test results, even when the rats were kept in darkness. On the other hand 7-dehydrocholesterol (provitamin D_3) administered subcutaneously effected no healing in the rachitic rats kept in darkness and only partial healing in irradiated rats. Irradiation of the rachitic rats alone under the conditions of the experiment did not prove curative. These findings indicate that it is doubtful whether the mammalian organism can produce any appreciable amount of provitamin D.

TEXTILES AND CLOTHING

1943 Year Book of the American Association of Textile Chemists and Colorists, Vol. XX (*New York: Amer. Assoc. Textile Chem. and Color., 1943, vol. 20, pp. 41–648, illus. 84*).—This volume is organized into several parts which are concerned with various phases of association organization, activity, and interest. Part 2, Committee Reports, presents the reports of the research committee and the subcommittees working on various methods and procedures. Part 3, Standard A. A. T. C. C. Test Methods—Official and Tentative, covers the following: Standard methods for determining the fastness of dyestuffs on the fiber, publications and test materials, the Launder-Ometer, fastness tests for dyed or printed cotton and linen, fastness tests for dyed or printed rayons, fastness tests for dyed or printed silk, fastness tests for dyed wool, fastness to perspiration of dyed textiles, fastness to light of textiles, fastness to acids and alkalies, fastness to carbonizing, fastness to sea water, fastness to rubbing (crocking), determination of shrinkage of textiles, evaluation of wetting agents, determination of water resistance of fabrics, methods of fiber identification and quantitative separation, determination of transference of color, test for resistance of fabrics and yarns to insect pests, evaluation of compounds designed to increase the resistance of fabrics and yarns to insect pests, fastness to atmospheric gases of dyes on cellulose acetate rayon, and fastness to dry cleaning. Part 4, Dyestuffs and Textile Chemical Specialties, gives a tabulation of American dyes and lists textile chemical specialties.

Directory of textile testing laboratories, commercial and educational (*Washington, D. C.: Textile Found., 1943, pp. 20+*).—This directory (revised), assembled to meet the needs of manufacturers and consumers, lists separately commercial laboratories and laboratories connected with educational institutions. The laboratories listed are classified (1) alphabetically, (2) according to tests they are equipped to perform, and (3) geographically. The information presented was supplied almost entirely by the laboratories listed.

The color fastness and physical properties of wool and rayon gabardines, H. M. FLETCHER and H. M. S. SHERWOOD. (Kans. Expt. Sta.). (*Amer. Dyestuff Rptr., 32 (1943), No. 13, pp. 280, 291–296, illus. 3*).—Nine viscose and cellulose acetate rayon mixed fabrics and nine all-wool fabrics in colors, including white

and dark and light red, green, blue, and brown, were used in this study. A study was made of their color fastness to light, their warmth as indicated by thermal transmission, their shrinkage, and their wearing quality as evidenced by dry and wet breaking strength and elongation, abrasion resistance, and dynamic properties with respect to load elongation. Thirty dry cleanings and long exposure to heat (50 hr. at 150° F.) and to light (80 hr. in the Atlas Fade-Ometer at 150° with humidity controlled) were variables introduced. The data from these experiments and the statistical treatment for determination of significance are reported, and the following summary presented: "The statistical analysis of the data on fading of the colored fabrics showed that neither the rayon nor the wool was superior. Dry cleaning had little effect on the color in both groups of fabrics. There was not a significant difference between fadings due to light and heat, but both produced considerably more fading than dry cleaning. The white rayon showed no change in color on exposure to light, but the wool turned yellow. On heating both turned, but the wool showed the greater color change. The breaking strength of the rayon gabardine was greater than wool gabardine. Moisture decreased the breaking strength of the wool less than that of the rayon, and the wool was more resistant to abrasion. Heat did not decrease the breaking strength of either significantly. Light decreased the strength of the wool much more than that of the rayon. When dry the wool had greater elongation than the rayon. Light, heat, and abrasion decreased the elongation of wool more than that of the rayon. Moisture greatly increased the elongation of the wool gabardines but did not significantly change that of the rayon. Dry cleaning did not decrease the breaking strength of the wool but decreased the rayon slightly. Dry cleaning did not affect the elongation. There was no significant difference in shrinkage of the two groups of fabrics. Neither the wool nor the rayon gabardines shrank excessively with dry cleaning. Both shrank more in the warp than in the filling. The wool increased in shrinkage with successive dry cleanings, but the rayon did not. The load-elongation curves showed that the rayon yarns were definitely different from the wool. The rayon showed a tendency for sudden yield points and exhibited some plastic flow, but the wool did not. The rayon was more wiry in 'feel,' and the wool had a softer 'hand.' Dry cleaning had no apparent effect on the dynamic properties of the yarns. The thermal conductivity of the wool gabardines was definitely less than the rayon. Dry cleaning did not affect the conductivity of either group of fabrics."

A comparison of methods for the determination of water absorbency by terry towels, V. B. Holland (*Amer. Dyestuff Rptr., 32 (1943), No. 8, pp. 167–170, illus. 6*).—The drop-square test, which consists in dropping a square of material on the surface of a beaker of water and noting the time required for the square to take up water and sink; the Larose method (E. S. R., 87, p. 464), involving absorption from wet porous plates under a definite pressure for measured periods of time; and the wick-up method, in which the water rise in definite intervals is noted in a strip having the lower end immersed in water, were the methods chosen for comparison in routine mill testing of absorbency in terry toweling. The results showed that where the terry towel had a uniform pile consistent checks could be obtained by all three methods, but that differences occurred in terry towels having figured designs. The Larose and wick-up methods yielded consistently characteristic curves and are considered suitable for use as standard procedures for measuring the water-absorbent qualities of terry towels. In order to obtain consistent results, however, both must be carried out under standard conditions of temperature and relative humidity and with a fair degree of skill.

Soil suspension method for testing mildew resistance of treated fabrics, M. S. Furry and M. Zametkin. (U. S. D. A.). (*Amer. Dyestuff Rptr., 32 (1943), No. 19, pp. 395–398, illus. 2*).—The test developed involves inoculation of leached samples by immersion in a soil suspension, thus subjecting the fabric to many types of organisms that attack cellulose. Greenhouse-composted soil is suitable and for inoculation is used in a thin suspension of 70 gm. of soil to 250 cc. of water. Strips of the treated fabric after immersion in this suspension for 30 min. are supported on glass fabric strips in culture bottles containing a suitable nutrient solution and incubated at 28° C. for 10 days for cotton fabrics and 14 days for jute fabrics. Control strips of untreated fabric are similarly inoculated and incubated to serve as a check on the microbial activity of the soil. The appearance of the incubated samples is recorded, and after washing and drying the breaking strength is determined on the inoculated controls (untreated samples), the inoculated treated fabric, and the original treated fabric, according to the raveled-strip method and under standard conditions. The inoculated controls should lose practically all their strength within the incubation period. The effectiveness of the treatment under test is determined from the breaking strength of the inoculated test strips in comparison with that of the original treated fabric. Results can also be evaluated in terms of a standard.

Application of the test to nine treated cotton fabrics showed that five of the nine finishing treatments were effective, these being as follows: Copper naphthenate, cuprammonium hydroxide, lead acetate with potassium dichromate, and the natural dye extracts—cutch and osage orange, with copper sulfate and potassium dichromate. Of the micro-organisms isolated from the soil used and applied as inocula in pure cultures, *Chaetomium globosum*, the *Metarrhizium* sp., and one of two species of *Fusarium* completely deteriorated the fabric; *Acrostalagmus albus*, certain species of *Alternaria*, *Cladosporium*, *Fusarium*, *Helminthosporium*, *Papulospora*, and one species of *Penicillium* caused between 60 and 75 percent loss in strength. *Aspergillus flavus* and *A. tamarii*, the *Trichoderma* sp., and two species of *Actinomyces* caused about 30 percent loss and one unnamed species of *Aspergillus* about 20 percent. A few species of *Aspergillus*, *Mucor*, and *Penicillium* did not deteriorate the fabric.

Observations on soil burial procedures, E. C. Bertolet (*Amer. Dyestuff Rptr., 33 (1944), No. 1, pp. 21–24*).—Advantages and disadvantages of various tests of mildew resistance are discussed. Of the tests available, the composted soil burial method was adopted by the Corps of Engineers, Jefferson Quartermaster Depot, as the only one available that could be considered to give an accelerated service test adequate for testing military fabrics. Certain limitations of this test were recognized, particularly the exclusion of the effect of ultraviolet radiation. As adopted for use, the tentative A. S. T. M. method was modified by reduction of time and temperature to 14 days at 75° ±5° F. and by horizontal burial at a depth of ¼ in. to make the test conditions more nearly approach service conditions for tentage and equipage. Experimental studies with leached or unleached samples may be made for 7, 14, 21, 28, 35, and 42 days, with the tests discontinued at the end of any period if the fabric disintegrates. Rope may be tested for as long as 1 yr. When removed from the soil the test sample is washed under running water, then air-dried, conditioned, and tested for tensile strength by the grab method. To pass specifications the loss in breaking strength of the finished material must not be more than 10 percent based on the finished (treated) material. Samples of untreated cotton material buried simultaneously must lose at least 90 percent of the original strength. This is a check on the efficiency of the burial. A few results obtained by application of the test to treated (water-repellent and mold-resistant finishes) ducks are reported.

New method for quantitative determination of moth damage to textile fibers, W. J. Hamburger and K. R. Fox (*Amer. Dyestuff Rptr., 32 (1943), No. 17, pp. 357–360, 373–374, illus. 7*).—The method developed and here described step by step involves determinations of the mean fiber length of the sample before and after a 7-day incubation period at 28° C. in the presence of a definite number (in proportion to the weight of the sample) of selected carpet beetle larvae. For determination of mean fiber length, the sample is prepared, by use of a Suter-Webb cotton sorter, in a staple array of uniform density; the area of this array divided by its base length gives the mean staple length. The reduction in mean staple length due to carpet beetle damage was found to correlate well with chemical determinations of the fluorine content of fiber samples treated with silicofluoride types of moth-proofing compounds and is considered, therefore, to be a sufficiently sensitive and accurate criterion for use in control work in commercial practice. The method used for the fluorine determination involved decomposition of the silicofluoride by treatment with strong sulfuric acid, removal of the hydrogen fluoride formed by steam distillation, and determination of the fluoride in the distillate by titration with thorium nitrate.

Deterioration of flameproofed cotton fabric, A. S. Tweedie and C. H. Bayley (*Amer. Dyestuff Rptr., 32 (1943), No. 20, pp. 427–428*).—Results are reported of investigations to determine the comparative deterioration, in terms of tensile strength losses and chemical damage, produced in cotton fabrics by the use of certain soluble flameproofing agents. The compound was applied at the end of each laundering treatment, usually in the last rinse, and the fabric (a special grade of light cotton sheeting) then centrifuged long enough to permit a solution retention of approximately 100 percent and, finally, hot pressed. All of the flameproofing agents tested resulted in measurable tensile strength losses (2.9–55.2 percent) at the end of 10 treatments, and in chemical damage to the fiber as indicated by increase in cuprammonium fluidity. The borax-boric acid mixture (7 and 3 parts by weight, respectively, per 100 by weight of water) gave the least indication of damage, while the other agents produced increasing damage in the following order: Borax-boric acid-ammonium dihydrogen phosphate (7–3–5), borax-boric acid-ammonium sulfate (7–3–5), ammonium dihydrogen phosphate (10), ammonium sulfamate (10), and ammonium sulfate (10).

A proposed method for the evaluation of detergents, V. B. Holland and A. Petrea (*Amer. Dyestuff Rptr. 32 (1943), No. 24, pp. P534–P537*).—This study presents some of the theoretical aspects of detergency as brought out by previous workers and proposes a method for the evaluation of detergents that measures quantities other than reflectivity as a means of characterizing the detergent. By the method proposed a measured quantity of a standard soil (containing Stoddard solvent, vaseline, paraffin wax, stearic acid, oleic acid, and Norit C) is applied to the weighed sample by means of the launderometer. The weighed soiled sample is then laundered under suitable conditions with the detergent in question and finally weighed to determine the amount of soil removed by the action of the detergent. Reflectivity or brightness increase brought about by laundering is determined from reflectivity determinations, by means of a Zeiss Pulfrich photometer, on the soiled and the laundered samples. For a more complete picture the washed sample is extracted to determine the amount of oils and fat remaining after treatment with the detergent. Results obtained in tests with bleached desized muslin sheeting indicated that the quantity of soil applied ranged from 14.5 to 19.5 percent. The percentage of soil removed and the brightness increased with the concentration of the detergent until a point of saturation was reached, at which no further soil was removed.

This would offer a method for determining the optimum concentration of a detergent for removing a specified soil under specific conditions. It is considered that the method, particularly as it applies to measurements of soil removal and extractable matter, offers possibilities for development into a standard procedure, although more work is required with different fibers, different soils, and different conditions (presence of acid, alkali, or hard water, for example) before standard conditions for such a procedure can be defined.

Report of committee on fastness to dry cleaning, C. A. SEIBERT ET AL. (*Amer. Dyestuff Rptr., 32 (1943), No. 17, pp. P362–P365*).—The method described was formulated to simulate, in procedure and results, practical processing and is offered as a tentative test by a research subcommittee of the American Association of Textile Chemists and Colorists. The method, presented in detail as to procedure, materials, and equipment, involves the use of two test samples on each of which is sewn a square of specified white material. The two test specimens are subjected to a specified dry-cleaning procedure, after which one specimen is rinsed with distilled water and finished by hand or steam pressing. The other, unpressed, test specimen is then subjected to a specified wet-cleaning procedure and finished by a hand or steam-press treatment. Specimens that withstand both the wet and dry procedures without appreciable color change and without staining the attached white fibers are considered as fulfilling commercial requirements and are assigned a class 3 rating. Those that withstand both procedures without appreciable color change but stain any attached white fibers are considered to fulfill commercial requirements if undyed or light-colored trimmings are removed before cleaning, and are assigned a class 2 rating. Specimens that do not fulfill class 3 requirements in the wet procedure but do so in the dry procedure are given a class 1 rating. Such material does not fulfill a reasonable dry-cleaning requirement, since it requires special attention by the dry cleaner in removing stains not removed in the dry-cleaning treatment. The committee suggests the use of certain control specimens, which may be obtained as indicated, to run in control tests as a means of determining that the test has been performed satisfactorily.

HOME MANAGEMENT AND EQUIPMENT

Some farm family gardens pay in dollars, M. E. TIFFANY and M. G. REID (*Iowa Sta. Res. Bul. 322 (1943), pp. 25–54*).—This report, based on information obtained from 55 families living in Story County in 1940 and 1941, presents the data on garden returns (in dollars and cents and in yields), costs and difficulties, and fruits and vegetables purchased. In these 2 yr., respectively, the garden fruits and vegetables, if purchased at local retail prices, would have cost an average of $47.50 and $16.50. The families averaged 2,180 lb. of vegetables. The gardens furnished 82 percent of the vegetables consumed per year by these families and 38 percent of the fruit. There were wide ranges in products and costs, but the latter averaged $6.07 per year and 99 hr. of labor. "Measured in pounds per family, Irish potatoes, tomatoes, cabbage, and sweet corn were the most important vegetables. Measured in number of farms, apples and cherries were the most important tree fruits, while strawberries and grapes were the most important perennial small fruits. Melons, too, were frequently raised in large quantities. . . . Chief obstacles reported to obtaining a greater share of the family food from the garden were lack of time for more gardening on the part of the homemakers, lack of suitable storage space, poor weather conditions, and 'bad luck.' Many renting families reported a desire for more fruit trees."

REPORTS AND PROCEEDINGS

Report on agricultural research [of Iowa Station] for the year ending June 30, 1943, I, II, R. E. BUCHANAN ET AL. (*Iowa Sta. Rpt. 1943, pts. 1 pp. 298, illus. 29; 2, pp. 79, illus. 12*).—In addition to the usual administrative data, part 1 consists mainly of project reports on the work of the year in the sections of agricultural engineering; agronomy (farm crops and soils); animal husbandry, including animal breeding, animal chemistry and nutrition, animal production, dairy husbandry, and poultry husbandry; bacteriology; botany and plant pathology; chemistry; dairy industry; entomology and economic zoology; forestry; genetics; home economics (foods and nutrition and household equipment); horticulture, including floriculture, turf grasses, pomology, and vegetable crops; and rural social science, including agricultural economics, consumption economics, rural education, and rural sociology; and statistics.

Part 2 is the eighth annual report of the Iowa Corn Research Institute. Following a report on Technological Problems as Related to War Demands on Corn, reports are given on soil and soil management as related to corn production; cultural methods and equipment; corn breeding; botany of corn; diseases and insects; corn composition; industrial utilization; corn and corn products in human and animal nutrition; economic phases of corn production and utilization; and history, literature, and bibliography.

Fifty-third Annual Report [of Washington Station], 1943, E. C. JOHNSON ET AL. (*Washington Sta. Bul. 435 (1943), pp. 163*).—This report summarizes the work of the year by subject-matter divisions (agricultural engineering, agronomy, animal husbandry, chemistry, dairy husbandry, entomology, farm management and agricultural economics, home economics, horticulture, plant pathology, poultry husbandry, rural sociology, and veterinary science); the Adams, irrigation, and tree fruit substations; the cranberry-blueberry laboratory; the Soil and Water Conservation Experiment Station; the nursery division of the Soil Conservation Service; the United States Fruit and Vegetable Products Laboratory; and the Western Washington Experiment Station (agronomy, chemistry, dairy husbandry, entomology, grazing, horticulture, plant pathology, poultry, and veterinary science). Brief abstracts are appended for the station publications and scientific papers.

What's new in farm science: Annual report of the director, [Wisconsin Station, 1943], I, compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 461 (1943), pp. 64+, illus. 6*).—This portion of the annual report of the station deals with studies on livestock problems, notably such factors as the use of vitamin supplements and hormones, treatments for mastitis, the use of cold pen-type barns for dairy cows, abnormalities in swine, meat substitutes for fur animals, swine hoofs as a protein supplement, and resistance to coccidiosis; feeding the family, including vitamin content of canned foods, oatmeal, meat, honey, and compressed yeast, iron in sorghum sirup, cooking quality of cheese, dried eggs, and telang and "sawdust" type livers; farm and home management, including machinery rental rates, labor supply, conservation farming, increased use of clover-timothy hay, tenancy, and high levels of farm production and living; marketing, including week-end shopping as a complication, durability of milk trucks, and butterfat in chocolate milk; dairy products, including a butterfat connserving spread, fortified milk as a source of vitamins, quality in Swiss cheese, enzymes in ripening cheese, use of propionates in dairy products, and high vitamin A potency of summer butter; photosynthesis as separate from oxygen production; differences in metabolism in plants and animals; nutrition studies, including vegetable fats v. butterfat in mixed rations, sulfa drugs as a cause of nutritional disturbances; needs for vitamins, bacon, folic acid, and biotin, isolation

of biotin, behavior of the eluate factor, and growth factors in linseed meal; and other problems referred to elsewhere in this issue.

Informe anual del director Instituto de Agricultura Tropical de Puerto Rico para el año fiscal 1942–1943 (Annual report of the director, Institute of Tropical Agriculture of Puerto Rico, for the fiscal year 1942–43), C. E. CHARDÓN (*Puerto Rico Inst. Agr. Trop. Informe An. 1943, pp. 69, illus. 8; Eng., pp. 35–67*).—This report, the first of this institute, notes progress on (1) phytohormones, including natural hormones of the sugarcane plant and bamboo and active substances in the pollen of hibiscus and sugarcane; the effect of synthetic hormones on the rooting of sugarcane seeds and various tropical ornamentals, fruits, and vanilla; and parthenocarpic effect of various chemicals on tomato, eggplant, avocado, guava, mango, peppers, and pumpkins; and (2) the mineral characteristics and mode of formation of tropical soils.

MISCELLANEOUS

Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1943–44, B. T. RICHARDSON (*U. S. Dept. Agr. Misc. Pub. 535 (1944), pp. 155+*).—This is the usual annual list (E. S. R., 89, p. 406) of the workers in agriculture and home economics in the land-grant colleges and experiment stations, the personnel of the Office of Experiment Stations, and the officers and standing and special committees of the Association of Land-Grant Colleges and Universities.

Colorado Farm Bulletin, [March–April 1944] (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 2, pp. 16, illus. 5*).—In addition to several articles noted elsewhere, this number contains the following: Three Irrigation Tests Give Indications for More Efficient Use of Water in 1944 (p. 2); Soil Laboratories Cooperating on Testing, How to Take Samples for Tests Explained, by D. S. Romine and D. R. McAllister (pp. 3–5) (coop. U. S. D. A.); and Increased Yields Shown by Corn Hybrids in Northern Colorado and Arkansas Valley, by D. W. Robertson and H. Fauber (pp. 13–15).

Publications available from the [Kansas] Agricultural Experiment Station (*Kansas Sta. Cir. 221 (1944), pp. [4]*).—An extension to February 1944 of the list previously noted (E. S. R., 90, p. 284).

Bimonthly Bulletin, Ohio Agricultural Experiment Station, [March–April 1944] (*Ohio Sta. Bimo. Bul. 227 (1944), pp. 81–131, illus. 6*).—In addition to seven articles noted elsewhere in this issue, this number contains Infant Mortality Highest in Rural Areas, by A. R. Mangus and R. L. McNamara (pp. 129–130), and the usual Index Numbers of Production, Prices, and Income, by J. I. Falconer (p. 131).

Colour terminology in biology, H. A. DADE (*Imp. Mycol. Inst., Mycol. Papers No. 6, (1943), pp. 21+, illus. 2*).—"We have a large number of common color terms, both in Latin and English, many of them indefinite or ambiguous, many often incorrectly applied. In this paper it is proposed to select from this collection suitable, and as far as possible well-known and suggestive, names useful alike for general descriptive purposes, for Latin diagnoses, and for specific or varietal names; to define them so that the use of each is restricted to a particular section of Ridgway's plates; and to explain the original significance and any subsequently modified meaning of the color names in current use by biologists."

NOTES

Arizona University.—*Science* notes that the university is acquiring the private herbarium of Dr. Forrest Shreve of the Carnegie Institution of Washington. This collection contains 30,000 specimens, about half of which are from northern Mexico and the remainder chiefly from the Southwestern States, Maryland, Georgia, and Alabama.

Colorado College and Station.—Leave of absence to engage in war work has been granted to S. C. McCampbell, extension entomologist, to study insecticides and equipment, including new products that will not be released for general use until war needs have been met and combination insecticides that need to be developed to meet war emergencies created by shortages of certain insecticidal ingredients. Dr. Hazel Stevens, associate professor and associate in home economics research, has been given an indefinite leave of absence. Dr. R. W. Roskelley has been transferred from the station to the extension service as assistant State supervisor, Victory Farm Labor Volunteers, Emergency Farm Labor Program. *Poultry Science* notes the appointment of F. H. Kratzer, associate in poultry husbandry in the California Station, as associate professor of poultry husbandry. Jasper J. French has been added to the staff to work on the corn improvement program.

Connecticut [New Haven] Station.—Dr. Lawrence C. Curtis, geneticist, has been granted a year's leave of absence to serve on a food mission to North Africa with the Division of Relief and Rehabilitation of the Foreign Economic Administration. This mission will study the production of food crops in North Africa and the distribution of these crops to the Allies and to liberated countries.

Kentucky University and Station.—One wing of the new animal pathology building has been completed and occupied. Much needed additional space for research in animal diseases has thus been provided.

Recent appointments include Robert Griffith as assistant and Elisha B. Lewis as assistant chemist in tobacco research and George Davis as acting field agent in poultry improvement. Resignations include E. A. Baute, field agent in poultry improvement; Thomas Strittmatter, assistant veterinarian; and Eugene S. McConnell, instructor and assistant in poultry, the last-named to manage a hatchery. Charles E. Wyatt, field agent in test demonstrations with the Tennessee Valley Authority, has been granted leave for military service.

Louisiana Station.—A State appropriation of $25,000 has been made for the purpose of establishing a livestock experiment station in the Florida Parishes. A tract of 248 acres of land has been donated, and 592 acres has been purchased.

A new animal hospital has recently been completed at a cost of $10,200 and will be used by the veterinary science department.

Montana College and Station.—Dr. Royse P. Murphy, associate professor and associate agronomist, has been granted leave of absence to accept a commission as ensign in the United States Naval Reserve. Everett E. Peterson, assistant professor of agricultural economics and rural sociology, has resigned to accept a position with the U. S. D. A. Bureau of Agricultural Economics. Dr. E. E. Frahm has been appointed assistant professor of chemistry in the station. Dr. R. E. Stitt, associate agronomist with the U. S. D. A. Bureau of Plant Industry, formerly stationed at Statesville, N. C., has been transferred to the station.

Rutgers University and New Jersey Stations—The honorary degree of doctor of science was recently conferred by the University of Maine on Dr. William H. Martin, dean of the College of Agriculture and director of the stations.

North Dakota Station.—The station distributed this spring to 830 North Dakota wheat producers 18,537 bu. of Mida hybrid hard red spring wheat, originated by the station. This extensive distribution, in lots ranging from 2 to 25 bu., was made possible by a system of increase under contract with selected growers. Mida wheat is reported to be highly resistant to leaf rust, stem rust, and stinking smut or bunt and to possess desirable milling and baking qualities.

Director H. L. Walster, who has been on leave of absence for several months as a consulting agricultural economist to the Federal Bureau of Reclamation in connection with the preparation of a report on the conservation, control, and use of the water resources of the Missouri River Basin, returned on May 18. Drs. H. L. Bolley, botanist and plant pathologist, and L. R. Waldron, plant breeder, were honored at the 1944 commencement of the college by the unveiling of portrait busts, ultimately to be cast in bronze and a gift of an alumnus of the institution. Dr. H. S. Telford, associate entomologist, has resigned to enter the research department of a commercial manufacturer of insecticides, fungicides, and related products. Dr. Jesse E. Parker, instructor in poultry husbandry and poultry husbandman in the Tennessee University and Station, has been appointed poultry husbandman, professor of poultry husbandry, and chairman of the department.

Pennsylvania College.—Harold E. Hodgkiss, professor of entomology extension since 1919 and previously assistant entomologist in the New York State Station in 1904–7 and 1908–19 and the University of Illinois in 1907–8, retired on July 1, becoming professor emeritus of entomology extension.

Utah College and Station.—Dr. George F. Knowlton, research associate professor of entomology, has been granted leave of absence to serve as entomologist on a civilian basis with the Ninth Service Command, U. S. Army Engineers. He will be in charge of the insect and rodent control program throughout the eight Western States. His work on the investigation of bee losses and his grasshopper control work with the extension service are being taken over by C. J. Sorenson.

Dr. D. E. Madsen, head of the veterinary science department since 1929, has resigned to enter private practice in California.

Vermont Station.—A Purnell project on milk and dairy products distribution is being started in an attempt to determine the effect of every-other-day delivery on cost of distribution and consumption of dairy products.

D. W. Whitman, assistant animal and dairy husbandman, has resigned to enter the armed forces. C. C. Larson, assistant botanist, who resigned for the same purpose on September 30, 1943, returned on May 5. E. W. Jenkins, assistant horticulturist, has resigned to accept a position with an aircraft corporation.

Washington Station.—According to a note in *Science*, Dr. T. W. Daniel, grazing specialist of the Western Washington Station, has been appointed professor of sylviculture in the Utah College. He will be in charge of instruction in sylviculture and will manage the forest nursery maintained jointly by the college and the U. S. D. A. Forest Service.

West Virginia Station.—An experimental cattle-feeding shed, 84 by 28 ft., of wood and concrete construction and designed to take care of about 40 head, has been completed on the animal husbandry farm. A granary, 36 by 50 ft., has also been built. On the station's new poultry farm an 800-hen laying house and central building, as well as a manager's residence, await installation of a water supply system.

The death on May 15 is noted of Alonzo B. Brooks, well known as a West Virginia naturalist, at the age of 71 years. A graduate of the university in 1912, he was the author of a comprehensive publication on West Virginia Trees, published by the station as Bulletin 175 in 1920.

Wisconsin University and Station.—According to *Wisconsin Country Magazine*, W. W. Wilcox, professor and research professor of agricultural economics in the Iowa College and Station, has been appointed professor of agricultural economics. T. L. Bewick, a pioneer worker with 4–H Clubs and State leader in this field since 1914, has resigned and has been succeeded by Wakelin McNeel, associated with the work since 1919. Charlotte Mees, instructor in home economics, has accepted a position in the University of Hawaii. The retirement is noted of Dr. E. B. Hart, head of the department of biochemistry for about 38 years and previously connected for 9 years with the New York State Station as assistant and associate chemist.

U. S. Department of Agriculture.—The death is noted on May 27 of Dr. W. W. Stockberger, associated with the Department since 1903. His early work was as a pharmacognosist, and in 1913 he assumed charge of drug, poisonous, and oil plant investigations. Since 1925 he had specialized in personnel problems, doing much pioneer work in the field of personnel administration. He was 72 years of age.

Dr. Thomas H. Kearney retired June 30 after nearly 50 years with the Department, mostly working on crop problems of the arid Southwest. A botanist by training, he had been in charge of alkali- and drought-resistant plant investigations, and later of Egyptian cotton investigations for the Bureau of Plant Industry. He developed four well-known cotton varieties, most recent being the highly productive hybrid S×P, particularly valuable in barrage balloon cloth, machine-gun belts, parachute webbing, and other products for which high-tensile strength is essential, as well as in fine fabrics such as broadcloth. Other phases of his work dealt with the alkali tolerance of various plants, date culture, and the production of olives without irrigation.

James A. Hyslop, entomologist in charge of the Division of Insect Pest Survey and Information of the Bureau of Entomology and Plant Quarantine since 1934, has retired as of August 1, terminating a service with the Department beginning prior to graduation from the Massachusetts State College in 1908. From 1909 to 1912, his work on cereal and forage insect investigations was cooperative with the Washington Experiment Station.

Dr. Charles H. Lane, associated with the agricultural education service of the Department from 1911 to 1917 and subsequently connected with the agricultural education work of the Federal Board for Vocational Education and the U. S. Office of Education, died in Providence, R. I., on June 25 at the age of 66 years. During most of his service with the Department, he was in charge of its work in agricultural education and of the abstracting of that subject in *Experiment Station Record.*

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The synthesis of condensed ring compounds.—IX, The reaction of 5-acetoxy-1,4-toluquinone with conjugated dienes, and the rules of Alder, E. W. J. and L. W. BUTZ. (U. S. D. A.), (*Jour. Organ. Chem., 7 (1942), No. 3, pp. 199-226, illus. 8*).—Continuing this series (E. S. R., 89, p. 275), when 1,3-cyclohexadiene and 1,3,5-hexatriene react with 5-acetoxy-1,4-toluquinone, an addition occurs at both the acetoxyethene and the methylethene links. The principal product is an angular acetate in each case. An angular acetate was the sole product isolated after reaction of 2,3-dimethyl-1,3-butadiene with acetoxytoluquinone. Three of the four theoretically possible isomers were isolated from the reaction products of cyclohexadiene and acetoxytoluquinone. Two of these were angular acetates, and one was an enol. The structures of the endo and exo angular acetates were proved by conversion to 2-methyl-1,4-naphthoquinone. The structure of the angular acetate from dimethylbutadiene was proved by conversion to 2,6,7-trimethyl-1,4-naphthoquinone. Hexatriene and acetoxytoluquinone gave an angular acetate and an enol in substantial yields. Of these compounds the structures were not proved.

The synthesis of condensed ring compounds, X, XI, W. NUDENBERG and L. W. BUTZ. (U. S. D. A.) (*Jour. Amer. Chem. Soc., 65 (1943), Nos. 7, p. 1436; 11, pp. 2059-2060*).—These two papers extend the investigation noted above.

X. *cis-9-Methyl-8-keto-2-octalin and cis-10-methyl-1-vinyl-1,7-naphthitadiene.*—The steps in this synthesis are very briefly indicated. The applicability of these reactions to the synthesis of steroids is pointed out.

XI. *A tricyclic compound by the dienyne double addition reaction.*—This paper reports the use of the dienyne double addition reaction for the synthesis of a tricyclic compound, a derivative of cyclopenta[a]naphthitane (dodecahydrocyclopenta[a]naphthalene).

1-Cyclopentenylisopropenylacetylene, isopropenyl-(2-methyl-1-cyclopentenyl)-acetylene, dimethyl-(1-hydroxy-2-methylcyclopentylethynyl)-carbinol, and the dihydrazide of a dimethyl ester of 8(14),9-chrysitadiene-trans-6,7-trans-11,12-tetracarboxylic acid were also prepared.

The synthesis of condensed ring compounds, XII-XIV. (U. S. D. A.). (*Jour. Organ. Chem., 8 (1943), No. 6, pp. 497-499; 500-508; 509-514*).—These papers continue the series noted above.

XII. *The preparation of a 5,6,8-triketo-9-methyl-2-octalin,* E. W. J. and L. W. Butz.—Paper 12 reports the synthesis of angle methyl triketooctalin, 5-methyl-7-naph-

[1] The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

thitene-1,2,4-trione, prepared by the addition of 5-acetoxy-1,4-toluquinone to 1,3,-butadiene, extraction of the products with aqueous alkali, and acidification of the water-soluble salts. Reduction of this trione enol with zinc and acetic acid gave 4-hydroxy-10-methyl-7-naphthitene-1,3-dione, and catalytic hydrogenation gave an octahydro compound, probably one of the 5-methylnaphthitane-1,2,4-triols. The triketooctalin resulted from the addition of butadiene to the methylethene link of the acetoxytoluquinone. 2-Methyl-*p*-naphthoquinone was isolated after oxidation of the neutral products. Some addition of the diene to the acetoxyethene link of the quinone is therefore indicated.

XIII. *The preparation of 5- and 6-carbalkoxy-1,4-toluquinones: Addition of 5-carbomethoxy-1,4-toluquinone and 6-carbomethoxy-1,4-toluquinone to butadiene,* W. Nudenberg, A. M. Gaddis, and L. W. Butz.—Under the experimental conditions employed, butadiene reacted only at the double bond with the ester group in 5-carbomethoxy-1,4-toluquinone and 6-carbomethoxy-1,4-toluquinone. The products, methyl 1,4-diketo-2-methyl-2,7-naphthitadiene-5-carboxylate and methyl 1,4-diketo-2-methyl-2,7-naphthitadiene-10-carboxylate were obtained as high-boiling liquids, possibly mixtures of the cis and trans isomerides. These angle esters were converted by aqueous methanolic potassium hydroxide at room temperature into a mixture of products from which were isolated 2-methyl-5,8-dihydronaphthalene-1,4-diol, 2-methyl-5,8-dihydro-1,4-naphthoquinone, and a yellow crystalline compound which may be *o*-pyruvylacetophenone.

The same three products of alkaline decomposition were obtained from a reaction product of butadiene and 6-carbocyclohexoxy-1,4-toluquinone, but the conversion was much smaller. Other new compounds prepared were: Methyl 3-methylgentisate, cyclohexyl 3-methylgentisate, methyl 4-methylgentisate, 5-carbomethoxy-1,4-toluquinone, and 6-carbomethoxy-1,4-toluquinone.

XIV. *2-Methoxy-5-methyl-2,7-naphthitadiene-1,4-dione,* M. Orchin and L. W. Butz.—This reports the preparation of 5-methyl-7-naphthitene-1,2,4-trione enol and its 2-methyl ether in good yield from 5-methoxy-2-methyl-1,4-benzoquinone. The 2-methyl ether was obtained as the chief product (75 percent yield) in the addition of this quinone to butadiene. A working hypothesis which may be helpful in the synthesis of angle methyl compounds from other *p*-toluquinones is presented.

Absorption of oxygen by glutathione in alkaline solution.—II, Kinetics of the reaction at pH 13, M. B. and H. A. Young. (Univ. Calif.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 9, pp. 1681-1687, illus. 7*).—In continuation of the work previously noted (E. S. R., 89, p. 278), the rate of absorption of oxygen by glutathione in the pH range 13-13.3 and in the presence of copper sulfate catalyst was measured. The effects of changes in copper sulfate and glutathione concentrations and oxygen pressure are noted, the rate law observed is stated, and a mechanism is suggested.

A comparison of the viscosity and certain microscopical properties of some Kansas starches, H. N. Barham, J. A. Wagoner, B. M. Williams, and G. N. Reed. (Kans. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 9, pp. 331-345, illus. 6.*)—Varietal and environmental differences in potatoes and sweetpotatoes influenced the viscosity, gelatinization temperature, granule size, and granule size frequency measurements of the starches obtained from them. There was no direct correlation of the granule and granule size frequencies, as they were affected by such differences, with either the viscosity or the gelatinization temperature, nor were the gelatinization temperature and viscosity directly related. That structural differences due to adsorbed materials are capable of markedly affecting the pasting behavior of a starch was demonstrated. The gelatinization temperature, based on the loss of anisotropy, was found not necessarily to correspond to that part of the

viscosity curve between zero and the initial maximum. Five hundred granules seemed a sufficient number to count in order to obtain the average size and the size frequency. A number smaller than this did not always permit a reliable statistical treatment. Curing of the sweetpotatoes lowered the gelatinization temperature, the granule size, and the viscosity of the starches. The late harvest of potatoes tended to raise the gelatinization temperature and to decrease the viscosity, but the average size of the granules was dependent upon the variety. The Warba variety of potatoes and the Little Stem Jersey variety of sweetpotatoes formed the most viscous pastes and the ones that thinned out least during cooking. Starches obtained from Kansas potatoes and sweetpotatoes were found of good quality. They were the equal of commercial starches if the potato starch used as the basis for comparison were an extracted starch.

Constituents of carotene extracts of plants, A. R. KEMMERER and G. S. FRAPS. (Tex. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 12, pp., 714-716, illus. 1*).—The crude carotene extracts of a number of materials as analyzed by adsorption in calcium hydroxide contained from 2.8 to 39.5 percent of impurity A, which consists of several pigments, 26.4 to 95.4 percent of β-carotene, 0 to 18.1 percent of a neo-β-carotene, 0 to 26.7 of a new pigment provisionally termed carotenoid X, and in a few cases α-carotene and neo-α-carotene. Biological assays showed that carotenoid X does not possess vitamin A activity and that the neo-β-carotene found has approximately one-half the potency of β-carotene. The carotene solutions prepared by several widely used methods for carotene were found to contain appreciable proportions of impurities, especially of carotenoid X. All the methods heretofore proposed are held to give only approximately correct results for carotene.

Studies on the fluorescence of chlorophyll: The effects of concentration, temperature, and solvent, F. P. ZSCHEILE and D G. HARRIS. (Ind. Expt. Sta.). (*Jour. Phys. Chem., 47 (1943), No. 9, pp. 623-637, illus. 4*).—A fluorescence photoelectric spectrophotometer, of which a description illustrated by a diagrammatic drawing is included, was employed to study factors influencing the fluorescence spectra of solutions of chlorophylls *a* and *b*. The effects of concentration and thickness of solution were studied in relation to the apparent wave length of the major fluorescence maximum. Errors due to reabsorption and to decrease of fluorescence intensity with time of irradiation were minimized by the use of a special capillary cell.

The fluorescence spectra of chlorophyll *a* in 13 solvents were determined. Component *b* was studied in ethyl ether. The fluorescence maximum of component *a* in ether solution was shifted to the red, and the maximum intensity was increased with decreasing temperature. Filtered radiation from either an incandescent source or a mercury arc produced the same fluorescence spectrum as did general radiation from these sources.

Oil of Artemisia tridentata (American sage brush), [I], C. R. KINNEY, T. W. JACKSON, L. E. DEMYTT, and A. W. HARRIS (*Jour. Organ. Chem., 6 (1941), No. 4, pp. 612-625*).—In the first of these two papers it is reported that, on fractionation of the oil, four main divisions were obtained. The first was characterized by the presence of the aldehyde methacrolein. The second contained essentially α-pinene. In addition, a lower- and a higher-boiling terpene were isolated. The third was the cineole fraction. α-Terpinene, also, was identified, and evidence was obtained for the presence of a third substance in smaller quantity. The fourth fraction contained large amounts of *d*-camphor. In addition, a liquid alcohol, isomeric with terpineol, was obtained and named artemisol. The acetate of artemisol appeared to be present in this fraction also.

Constituents of Artemisia tridentata (American sage brush), II, C. R. KINNEY and J. SUGIHARA (*Jour. Organ. Chem., 8 (1943), No. 3, pp. 290-294*).—The second paper, devoted largely to the nutritional qualities of the plant in question, states that sagebrush is an excellent feed for animals, of high glyceride fat content, the available carbohydrates also high, and the protein and ash adequate. Tannins are present, but in quantities insufficient to be a source of tanning material. The bitter taste is due mainly to a glucoside. Sagebrush contains small quantities of alkaloids, but neither quinine nor santonin could be detected.

Avocado oil studies (*Puerto Rico Sta. Rpt. 1943, pp. 25-26*).—Histological work on sections and smears of avocado pulp, before and after lime treatment to release the oil for pressing out, indicated the presence of an emulsion in the fresh pulp cells and the break-down of cell walls by the action of unslaked lime.

An examination of the fatty oil from buffalo gourd seed, J. W. WOOD and H. A. JONES. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 9, p. 1783*).—The seeds of *Cucurbita foetidissima,* resembling small pumpkin seeds, contain 29.7 percent of an oil extractable by ether. The crude ether-extracted oil has a yellowish-green color in thin layers and a brownish-red color in moderately thick layers. The oil has a bland, fatty taste and a peculiar fatty odor. The physical and chemical constants of the crude oil are given. In general, the characteristics of the oil are similar to those of pumpkin seed oil.

Cinchona chemistry (*Puerto Rico Sta. Rpt. 1943, pp. 8-9*).—The alkaloid content was found not correlated with bark thickness.

Volumetric estimations of total alkaloid content were made by extraction with benzene, evaporation of most of the solvent, addition of excess standard acid, removal of the remaining solvent, and titration of the excess acid with standard sodium hydroxide solution. Erratic results were given by some indicators. The glass-electrode method showed an end point pH value of 6.4 at 27° C. to get the closest agreement with the results obtained by the gravimetric method. It was also found that lactic acid is a good solvent for the cinchona alkaloids and has the advantage of not being volatilized from boiling aqueous solutions. A 0.2-N solution was used as a standard acid for the volumetric determination of total alkaloids in cinchona bark. Results obtained with the freshly prepared and standardized solution were comparable to those obtained with standard hydrochloric acid. However, after standing a few days the lactic acid solution became infected with a bacterial growth which increased the acidity of the solution and gave erratic results.

Chemical studies (*Puerto Rico Sta. Rpt. 1943, pp. 16-19*).—Development of a spectrophotometric determination of rotenone, based upon the color produced by dilute nitrite solutions in alcoholic potassium hydroxide solution, is described. A study of sun, shade, and oven-dried methods indicated no practical differences as to the rotenone content of *Derris* roots.

Determination of permeability of agricultural spray coatings to water vapor, C. L. COMAR and E. J. MILLER. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 12, pp. 737-740, illus. 4*).—A simple empirical method capable of yielding reproducible permeability measurments on films formed from wax and oil-spray emulsions of the oil-in-water type is described. A commercially available permeability cup is used. The experimental conditions are easily duplicated.

For the type of film studied, a linear relationship between moisture impedance and film thickness was found. Advantages in the use of paraffin wax are demonstrated, and the role of bentonite in the emulsion is indicated.

Origin and relationship of acetylmethylcarbinol to 2:3-butylene glycol in bacterial fermentations, G. L. Stahly and C. H. Werkman. (Iowa Expt. Sta. and Ohio State Univ.). (*Biochem. Jour., 36 (1942), No. 7-9, pp. 575-581, illus. 1*). —In either aerobic or anaerobic fermentations by *Acrobacillus polymyxa,* the addition of acetaldehyde to a glucose-containing medium increased the yields of ethyl alcohol, acetylmethylcarbinol, and 2,3-butylene glycol. Acetaldehyde was found to be fixed by the addition of $CaSO_3$ to a normal fermentation, an observation which is held to support the probability of an intermediary role of the aldehyde. The addition of acetate increased the yields of acetylmethylcarbinol and 2,3-butylene glycol. A marked drop in redox potential and a rapid fermentation of the glucose followed inoculation of a vigorously oxygenated glucose medium with *A. polymyxa.* The potential rose only after most of the glucose had been fermented. Large quantities of 2,3-butylene glycol accumulated, while the redox potential remained low; part of the glycol was oxidized to acetylmethylcarbinol after the Eh attained a moderately high level. Little acetylmethylcarbinol accumulated during the early stages of the fermentation; added carbinol was reduced to glycol, but only when the potential was low.

It is suggested that acetylmethylcarbinol and 2,3-butylene glycol comprise a reversible oxidation-reduction system. A low redox potential favors the accumulation of the glycol; a high potential favors carbinol formation.

Some enzymes present in highly purified invertase preparations: A contribution to the study of fructofuranosidases, galactosidases, glucosidases, and mannosidases, M. Adams, N. K. Richtmyer, and C. S. Hudson (*Jour. Amer. Chem. Soc., 65 (1943), No. 7, pp. 1369-1380, illus. 1*).—Five highly purified invertase preparations, obtained from both brewers' and bakers' yeasts and by different methods of purification, were compared in their behavior toward 28 carbohydrate substrates. The fructofuranoside linkages in sucrose, raffinose, stachyose, and inulin were hydrolyzed by all 5 invertase preparations, but the relative rates of hydrolysis varied markedly with the source and with the method of purification of the enzyme solution. The α-*d*-galactosidase present in the brewers' yeast invertase preparations was used in a comparative study of the hydrolysis of melibiose, α-methyl-*d*-galactoside, α-phenyl-*d*-galactoside, and the configurationally related β-methyl-*l*-arabinoside. The galactoside linkages in stachyose and manninotriose were hydrolyzed by the preparations from brewers' yeast which contain α-*d*-galactosidase but not β-*d*-galactosidase. The purest invertase preparation, from brewers' yeast, contained a small amount of β-*d*-glucosidase which was capable of hydrolyzing amygdalin gentiobiose and β-phenyl-*d*-glucoside, but not cellobiose or lactose. Invertase preparations from both brewers' and bakers' yeasts contained small amounts of a new enzyme, a β-*d*-mannosidase which hydrolyzes β-phenyl-*d*-mannoside. No evidence to indicate the hydrolysis of an α-*d*-fructofuranoside (isosucrose), or of any β-*d*-galactoside, α-*d*-glucoside (including the α- and β-dextrins), or α-*d*-mannoside by these highly purified invertase preparations was obtained. Melezitose and α-methyl-*d*-manno-*d*-gala-heptoside also were not hydrolyzed.

Enxyme action dominated by associated colloids, H. C. Eyster (*Plant Physiol., 18 (1943), No. 2, pp. 306-307*).—The author reports upon a series of experiments in each of which 50 cc. of 1 percent soluble starch, 5 cc. of a 1-percent diastase solution, and enough of each of several narcotic substances to give the stated concentration were diluted to 100 cc. with distilled water. The concentration for each narcotic was based on the final solution volume of 100 cc. The charcoal was kept dry and carbon dioxide-free in a desiccator with $CaCl_2$ near the top and KOH on the bottom. The temperature of the digestive mixtures was kept at approximately 25° C.

Ethyl alcohol, ether, and chloroform (in 25-percent concentrations) decreased the digestive action of diastase on soluble starch when no charcoal was present. When associated with charcoal, however, the digestive action was increased. "It appears that the charcoal adsorbs the enzyme and prevents it from acting freely on the soluble starch. It also appears that the narcotics," having more effect on the adsorptive capacity of charcoal than on the adsorptive capacity of enzymes, "release the enzyme from the charcoal particles and give it greater freedom to digest the soluble starch." Sulfanilamide (in a concentration of 0.2 percent) did not alter the activity of diastase appreciably. The effect, if any, was a very slight increase in the rate of diastatic activity. "This is commensurate with the effect of sulfanilamide on the action of diastase in the absence of charcoal, i. e., sulfanilamide reduces diastatic activity very slightly. . . .

"These findings . . . indicate that diastase in liver cells is adsorbed on cellular colloids such as proteins, and that all enzymes in whatever cell may be similarly associated with colloids. . . . The influence of a factor on isolated enzymes is not necessarily the same as that on enzymes in cells. The associated colloids dominate the action of enzymes, and factors of the environment may act chiefly in the liberation of enzymes from the associated colloids or vice versa in more completely adsorbing the enzymes on their associated colloidal substances."

[Reports of referees and associate referees on analytical methods] (*Jour. Assoc. Off. Agr. Chem., 26 (1943), Nos. 2, pp. 203-241, illus. 2; 3, pp. 299-300, 301-310, 313-317, 324-335, 340-354, illus., 3; 4, pp. 481-485, illus. 1*).—Of the referees' reports here listed, those contributed from the State experiment stations or from the U. S. Department of Agriculture are designated below: Phosphoric acid—I. Factors affecting the availability of ammoniated superphosphates, by J. O. Hardesty, W. H. Ross, and J. R. Adams (pp. 203-211) (U. S. D. A.); mineral mixed feeds, by A. T. Perkins and J. F. Merrill (pp. 212-214) (Kans. Expt. Sta.); starch in raw and baked cereals, by M. P. Etheredge (pp. 214-220); ash, by J. L. St. John (pp. 220-226) (Wash. Expt. Sta.); total solids and ether extract in fish, by M. Tubis (pp. 226-232); detection of caramel in vinegar, by A. M. Henry and J. W. Sanders, Jr. (pp. 233-237); spectrophotometric methods—quantitative determination of quinine by absorption spectrophotometry, by J. Carol (pp. 238-241); beer, by H. W. Rohde (pp. 299-300); pH in distilled alcoholic beverages, by M. Rosenblatt (pp. 301-304); baked products other than bread, by N. H. Walker (pp. 305-310); halogens in halogenated fluoresceins, by J. H. Jones (pp. 313-317); fruits and fruit products, by R. A. Osborn (pp. 324-331); potassium in fruits and fruit products—volumetric chloroplatinate method, by H. W. Gerritz (pp. 332-334); P_2O_5 in fruits and fruit products—volumetric method, by H. Shuman (pp. 334-335); fat in cooked animal feeds containing cereals (acid hydrolysis), by S. B. Randle (pp. 340-346) (Ky. Expt. Sta.); selenium, by A. K. Klein (pp. 346-352); salt in egg products, by L. C. Mitchell and W. Horwitz (pp. 352-354); and hops—with special reference to the determination of their alpha resin content, by F. Rabak (pp. 481-485) (U. S. D. A.).

Pipetting apparatus, W. G. Schneider (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 12, p. 764, illus. 1*).—A screw piston operating in a small brass cylinder of about 25-cc. capacity and filled with glycerol is placed in a horizontal position. A glass capillary tube connected to the brass cylinder is bent at a right angle upward, carries an expansion bulb in which the glycerol rises to about one-half the height of the bulb, and is further bent twice at right angles, ending with a short descending arm passing into a rubber stopper. The mouth end of the pipette is inserted into the lower end of the stopper and is filled, its contents brought to the mark, and delivery of the contents effected by manipulations of the screw piston.

A symplified lyophil apparatus, D. H. Campbell and D. Pressman (*Science, 99 (1944), No. 2571, pp. 285-286, illus. 2*).—A compact and efficient lyophil apparatus for small-scale laboratory work is described and diagramed. The outer jacket has one small opening for evacuating the inner chamber and four openings to which drying flasks are attached. By means of the apparatus, 150 gm. of distilled water were completely evaporated in about 5 hr. Water was evaporated from protein solutions at a comparable rate.

Modified amino nitrogen apparatus for insoluble proteins, D. G. Doherty and C. L. Ogg. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 12, pp. 751-753, illus. 4*).—An accessory reaction chamber for use with a standard manometric Van Slyke apparatus (E. S. R., 26, p. 22) was designed to permit introduction of large samples of solid material, removal of the gas evolved at stated intervals, and easy cleaning of the chamber at the end of the analysis. The calibrated Van Slyke reaction chamber is used only for measurement of the nitrogen evolved. The amino nitrogen content of several proteins and substituted proteins was determined with the aid of the auxiliary chamber. A photograph and a dimensioned detail drawing illustrate the construction of the apparatus.

Identification of organic acids by partition between ethyl ether and water, O. C. and V. H. Dermer. (Okla. A. and M. Col.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 8, pp. 1653-1654*).—In the use of the extraction method in identifying an unknown acid, this procedure may be followed: Adjust the acid to 0.100 ± 0.005 N by preliminary titration and appropriate dilution. Measure 50 cc. of this solution and 50 cc. of water-saturated ether, made from C. P. reagent, into a glass-stoppered bottle and shake them together for 5 min. or more at $25.0° \pm 0.5°$ [C.]. Allow several minutes for separation of layers, then pipette two 20-cc. portions from each layer and titrate them with standard 0.1 N alkali, with phenolphthalein as indicator. The mean value of C_w/C_e (in terms or normalities), used in conjunction with the series of values given, provides strong evidence of the nature of the acid. Partition ratios of a number of acids are given. The precision of measurement of these ratios is about $\pm$ 2 percent of their own values in the region where $C_w/C_e = 1$, but decreases to $\pm$ 4 percent when C_w/C_e is as large as 35 or as small as 0.05. It is also noted that for still higher values of the ratio the precision is much poorer, $\pm$ 10–20 percent.

Semi-micro estimation of reducing sugars, H. Weinmann (*Plant Physiol., 19 (1944), No. 1, pp. 148-156*).—Aliquots to contain not more than 20 mg. of glucose or its equivalent in reducing power are treated in centrifuge tubes with Fehling solution under exactly specified conditions, the precipitate is separated and washed by centrifugation, it is redissolved in a standard ferric ammonium sulfate solution, and the ferrous salt formed is titrated with standard potassium permanganate solution. Quantities of glucose ranging from 0.1 to 20 mg. could be estimated accurately to the nearest 0.1 mg. Data presented show that for six monosaccharides the method gives values acceptable for practical purposes. Factors for the calculation of lactose and maltose are given. Determinations of reducing and nonreducing sugars in a number of plant extracts by the new method yielded values which in most cases checked well with those obtained by a standard copper-reduction method.

Microdetermination of glycolic and oxalic acids, V. P. Calkins (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 12, pp. 762-763, illus. 1*).—A quantitative colorimetric micromethod for glycolic acid has been devised from a sensitive qualitative spot test based on the color produced with 2,7-dihydroxynaphthalene in acid solution. The same reaction may be employed for the quantitative microdetermination of oxalic and glyoxylic acids after reduction of these acids to glycolic acid by means of powdered magnesium.

Glycolic acid appears to be an intermediate product in the oxidation of ascorbic to oxalic acid.

N-benzylamides as derivatives for identifying the acyl group in esters, O. C. Dermer and J. King. (Okla. A. and M. Col.). (*Jour. Organ. Chem., 8 (1943), No. 2, pp. 168-173*).—According to the method described, 1 cc. of a liquid ester (or acid) or 1 gm. of a solid, is added to 3 cc. of benzylamine together with 0.1 gm. of ammonium chloride. The mixture is refluxed for 1 hr., conveniently in a pyrex test tube with finger condenser. It is cooled and washed with water to remove excess amine; in case no solid separates, acidification with hydrochloridic acid will sometimes precipitate the desired amide. Again, if enough unreacted ester is left to keep the amide in solution, it is often possible to expel the ester by boiling the oily layer with water. The solid amide is isolated by filtration, dried, washed with ligroin to remove soluble impurities, and recrystallized, usually from aqueous acetone or ethanol. From esters of some of the higher alcohols (butyl, amyl, etc.) solid derivatives were not obtained directly. In such instances, the samples were refluxed for ½ hr. in 5 cc. of methanol containing a little sodium methoxide. After the excess methanol had been distilled off, the remaining ester was successfully aminolyzed by the usual procedure.

Of somewhat more than 90 esters and free acids tested, 68 formed such derivatives, 31 of them claimed as new. The method was found not to yield satisfactory derivatives from esters of inorganic acids, sulfonic acids, keto acids, polynitro aromatic acids, and some halogenated aliphatic acids. The amides formed by hydroxy acids, alkoxy acids, and polybasic acids, or by their respective esters, were found to constitute excellent identifying derivatives. Those from fatty acids melted at temperatures too low and too close together to be useful.

Rapid analytical methods for some of the more common inorganic constituents of plant tissues, R. C. Lindner. (U. S. D. A.). (*Plant Physiol., 19 (1944), No. 1, pp. 76-89, illus. 1*).—About 100 mg. of dry material or 10 cm.^{2} of leaf material are digested with 2 cc. of concentrated sulfuric acid with the addition of sufficient 30 per cent hydrogen peroxide, added a little at a time, to complete oxidation to a colorless solution. The digestion is made up to 100 cc. Colorimetric determinations of nitrogen are made by the Nessler solution method, with the addition of sodium silicate to prevent turbidity; phosphates by a form of the Denigès reaction (E. S. R., 44, p. 611); and magnesium by modification of the titan yellow method. Potassium and calcium are determined by turbidity methods for which precipitation is effected by the cobaltinitrite and oxalate methods, respectively.

Boron tests and determination for soils and plants, K. C. Berger and E. Truog. (Wis. Expt. Sta.). (*Soil Sci., 57 (1944), No. 1, pp. 25-36, illus. 4*).—Improvements in the procedure include the use of a combination quinalizarin-sulfuric acid solution and special equipment for storing and dispensing this reagent. The color reaction was found virtually instantaneous. The color readings can be made as soon as the test solution containing the color reagent has been cooled to room temperature. Use of a photoelectric colorimeter (E. S. R., 85, p. 298) for making the color readings proved satisfactory when proper precautions in the selection and care of colorimeter tubes for holding the test solution were taken. Visual readings by means of comparator tubes gave equally satisfactory results. Detailed directions for the application of the quinalizarin reaction to the determination of the available boron of soils extracted with boiling water, total boron of soils brought into solution by fusion with sodium carbonate and treatment with weak acid, and the total boron of plant materials brought into solution by ashing and extraction with dilute acid are given.

The procedure involving use of quinalizarin was compared with a procedure involving use of curcumin for development of color. Both gave equally satisfactory results. The former is less laborious and quicker. The latter has the advantage of using reagents more easily prepared and handled.

Determining the mechanical stability of emulsions: A rapid quantitative method, R. C. MERRILL, JR. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 12, pp. 743-746, illus. 5).*—A method for determining the mechanical stability of emulsions involves measuring the rate of separation of the internal phase under a constant centrifugal force. The reciprocal of the initial rate of separation at a constant centrifuge speed is taken as a quantitative index of the mechanical stability of the emulsion. Applied both to water-in-oil and to oil-in-water emulsions stabilized by lecithin, soaps, and vegetable gums, the method gave in a few hours results apparently comparable to those obtained by more tedious methods involving other factors and requiring measurements over many months.

Definite effects of the age of the emulsion on its mechanical stability as determined by this method were found in soap and saponin-stabilized emulsions.

Estimation of vitamin A, E. M. HUME (*Nature [London], 151 (1943), No. 3836, pp. 535-536).*—This report of the vitamin A Subcommittee of the International Conference on Vitamin Standardization is concerned with experimental work organized by this committee for determining a factor for relating the results of spectrophotometric tests for vitamin A with the results of biological tests. In biological experiments with rats a comparison was made of the vitamin A potency of vitamin A β-naphthoate and of international standard β-carotene. Spectrophotometric estimations were made at the end as well as at the beginning of the feeding tests, so that the stability of the test solutions could be controlled. For the solution of vitamin A β-naphthoate used the value obtained for $E^{1\%}/_{1\,cm.}$ 325 mμ was 0.094. The weighted mean of the biological results from nine laboratories was 166 International Units per gram. The conversion factor for this experiment was therefore $166 \div 0.094 = 1{,}770$, which with two previously obtained values (1,570 and 1,820) gave a conversion factor of 1,740. The difference between this and the factor commonly used in the United States (2,000) is explained by the wide use of the U. S. P. reference cod-liver oil as a standard of reference in the United States, while the international standard preparation of β-carotene is in general use in Great Britain. The value of 3,000 I. U. per gram for the U. S. P. reference oil, based on tests against the 1931 mixed carotene standard, is considered too high, since comparison with the 1934 pure β-carotene standard gave a value of 2,619 I. U. per gram. As a solution to the difficulty which has arisen from the use of two different conversion factors, it is suggested that it be recognized that the U. S. P. and International Units have not the same magnitude, but that the former is only $^{2619}/_{3000}$ or about 7/8 of the latter and that the respective conversion factors are about 2,000 and 1,740.

The fluorescence of vitamin A, H. SOBOTKA, S. KANN, and E. LOEWENSTEIN (*Jour. Amer. Chem. Soc., 65 (1943), No. 10, pp. 1959-1961, illus. 1).*—Vitamin A preparations in alcohol solution were observed to display upon irradiation an initial steep increase in fluorescence, followed by complete destruction of the fluorescence during prolonged irradiation; in ether, chloroform, or benzene, however, there was sometimes a small initial drop, but always a quick return to a level of steady intensity which decreased but slowly. A study of this phenomenon of decreasing fluorescence with continued ultraviolet irradiation, using vitamin A esters, showed that both the increase and the decrease in fluorescence were of photochemical nature, but that the decrease in fluorescence was impeded by bubbling

a slow current of fine CO_2 or N_2 bubbles through the solution. The phenomenon was shown by vitamin A_2 ester but not by the free vitamin A alcohol.

Über die Entfärbung der Untersuchungslösungen bei der quantitativen Bestimmung von Nicotinsäure und Nicotinsäureamid [The decolorization of test solutions in the quantitative determination of nicotinic acid and nicotinamide], K. Täufel and F. Dahle (*Ztschr. Untersuch. Lebensmtl., 85 (1943), No. 5, pp, 414-423, illus. 1*).—The effectiveness of various methods for removing interfering colored substances in the photometric determination of nicotinic acid by the cyanogen bromide-aniline reaction was investigated. The test solutions contained known amounts of nicotinic acid and nicotinamide with and without coloration of the solutions with caramel. The tests were carried out with and without preliminary hydrolysis of the amide with sulfuric acid at pH 1. From the results obtained it is considered (1) that adsorption of the nicotinic acid and the colored substances on charcoal with selective elution of the vitamin (with ethanol, methanol, benzine, or barium, sodium, or ammonium hydroxide, is not satisfactory since the vitamin is not completely eluted or because the colored material is simultaneously eluted; (2) that decolorization with fuller's earth is not satisfactory, although (3) the use of suitable earth permits, in an acid medium, adsorption of the vitamin which may then be satisfactorily eluted with barium hydroxide without removal of any of the adsorbed coloring matter; (4) that precipitation of the colored material by zinc or stannous hydroxide is not satisfactory because the precipitated hydroxide adsorbs some of the vitamin; and (5) that extraction of the interfering colored substance, according to the method of Ritsert (E. S. R., 82, p. 440), gives good recoveries of nicotinic acid when benzol or isopropyl alcohol-chloroform are used as the solvents.

The assay of riboflavin in cereals and other products.—I, Microbiological assay. II, Fluorometric assay, E. C. Barton-Wright and R. G. Booth (*Biochem. Jour., 37 (1943), No. 1, pp. 25-30*).—*Lactobacillus casei* from Snell and Strong's original strain No. 7469, which alone of the strains tested gave a quantitative response to riboflavin, was used as the test organism. The method employed for growth of the organism and for the assay was similar to that of Snell and Strong (E. S. R., 82, p. 587) with certain modifications, including the further addition of asparagine, xylose, pantothenic acid, and nicotinic acid to the basal medium and the preparation of fresh inoculum from the stock agar culture for each set of determinations. The presence of xylose resulted in better agreement between replicate determinations and a larger spread of readings between concentration levels in the case of nephelometric determinations. Fresh inoculum for each determination appeared to be necessary to prevent the occurrence of heavy growth in the riboflavin-free blanks. The titration was carried out in the fermentation tube itself with the use of a comparator. Fat and starch exerted stimulating effects on the organism. Cereal products high in fat were therefore extracted with light petroleum. Extracts for analysis were freed of starch by hydrolysis of the sample with 0.25 N acid or with ptyalin. Results are reported for determinations on different varieties of wheat, various fractions of the wheat grain, wheat flours, barley, rye, corn, soybean, and yeasts. Bread made with added riboflavin showed no significant destruction of the riboflavin during baking.

A fluorometric method (described) was found applicable to wheat products providing the riboflavin in the hydrolyzed sample extract was concentrated, by absorption on Superfiltrol and elution with a water-pyridine-acetic acid mixture, and providing interfering colloidal or suspended material was removed by extraction of the riboflavin from the eluate by means of a nonaqueous medium, *n*-butyl

alcohol. The fluorometric method, however, was much more laborious and time-consuming than the microbiological procedure.

The application of the Spekker photoelectric absorptiometer to the determination of vitamin C, A. M. Taylor (*Biochem. Jour., 37 (1943), No. 1, pp. 54-58, illus. 2.*).—The method developed to differentiate the rapid reduction effected by ascorbic acid from the slower reduction due to nonspecific reductants is as follows: A solution of 2.6-dichlorophenolindophenol placed in increasing amounts in a series of tubes and diluted to a fixed volume is treated in each case with a uniform aliquot portion of the test solution. The color of each mixture is measured by means of a Spekker photoelectric absorptiometer, an instrument which measures the residual light transmission under test. A further similar aliquot of the test solution diluted to the same volume with distilled water is used as a standard. The reading on each mixture is corrected for fading by making three readings over about a minute and extrapolating back to 0 time. The color values of the mixtures after correction are then plotted against the amount of indophenol agent added; the appearance of the excess reagent is marked by a sudden increase in the slope of the resulting curve, the point of flexure corresponding to the end point of the titration. This method gives satisfactory recovery of ascorbic acid in the presence of the reductants cysteine and glutathione in amounts up to 10 times that of the ascorbic acid itself. Applied to plant materials, including both natural and manufactured products, the method indicates in some cases, by the shape of the fading curves, that nonspecific reductants are present. In these cases the Spekker titration gives lower results than the visual titration procedure. Lemon juice shows little variation between the results obtained by the two methods.

Stability of ascorbic acid in metaphosphoric acid extract, L. W. Mapson and C. A. Mawson (*Nature [London], 151 (1943), No. 3825, pp. 222-223, illus. 2.*)—Pure ascorbic acid in 5 percent HPO_3 solution was found to remain stable for at least 2 days at 20° C. if kept in the dark, whereas if kept in the daylight 50 percent was oxidized within 53 hr. At 0° in the dark, there was no deterioration over a period of 6 days. Irradiation of the solution with ultraviolet light had an even greater destructive effect than daylight. Ascorbic acid in vegetable extracts (cabbage, potato, turnip) was less stable, whether in the light or in the dark, than were solutions of the pure acid. In daylight at 20°, the rate of oxidation of ascorbic acid in HPO_3 extracts of foods was some two to three times greater than that in pure solution. Loss was less when the supernatant extract was separated from the residue. These results indicate that samples for analysis for ascorbic acid in 5 percent HPO_3, or a mixture of HPO_3 and trichloroacetic acids, should be kept in the dark if any delay between extraction and analysis occurs. If kept at 0°, there should be no loss over a period of 2 days, but at room temperature the analysis should be completed within 24 hr. Any precipitate should be separated from extracts to be held.

Factors determining the consistency of commercial canned tomato juice, Z. I. Kertesz and J. D. Loconti (*New York State Sta. Tech. Bul. 272 (1944), pp. 36, illus. 5).*—Among the properties which determine the commercial value of canned tomato juice, the authors find consistency to be apparently the least understood. They present a scheme for the systematic investigation of the factors which may or do influence the consistency of tomato juice.

The role and importance of serum viscosity was studied in detail. A viscous serum, in the authors' opinion, is an indispensable prerequisite for a tomato juice of desirable consistency. The proportion and character of the suspended solids is also of importance, and the contribution of these to the "gross viscosity" of the

juice was determined. A tentative definition of desirable consistency is proposed, according to which a tomato juice of desirable consistency should have a serum showing a relative viscosity of 1.4–2.0, when measured by the Ostwald viscosimeter at 30° C. At the same time, the gross viscosity of the juice, as measured by the Stormer viscosimeter at the same temperature, should be in the range of 1.5–2.2 relative viscosity. Tomato juices which showed these characteristics exhibited a pleasing smoothness in their texture.

A survey of commercial canned tomato juice samples demonstrated that few of them fall within these ranges of gross and serum viscosities. Relatively few commercial samples contained a serum whose viscosity was in excess of that contributed by the dissolved sugars. Experimental evidence showed that only a slight increase in the preheating temperatures used during manufacturing a viscous serum may often produce a juice of superior consistency.

Composition and quality of musts and wines of California grapes, M. A. Amerine and A. J. Winkler (*Hilgardia [California Sta.], 15 (1944), No. 6, pp. 493-673+*).—This number is a detailed report, of more or less monographic character and proportions, upon experiments on numerous grape varieties as grown in several climatically different sections of the State, with a view to establishing the suitability or nonadaptability of each grape variety to California conditions, and the effects of varied verification procedures and subsequent treatment and of other factors upon the type and quality of the wine. Full descriptions of wine varieties and their characteristics, with special reference to California viticulture and enology, classify the varieties into groups of recommended types, varieties recommended only with specific reservations, and varieties not recommended for any wine-making use in California. The grape-growing parts of the State are divided into five regions, and recommendations of grape varieties include specification of the region or regions in which each is adapted for vineyard use.

AGRICULTURAL METEOROLOGY

Cloudiness and precipitation in relation to frontal lifting and horizontal convergence, J. M. Austin (*Mass. Inst. Technol. and Woods Hole Oceanog. Inst., Papers Phys. Oceanog. and Met., 9 (1943), No. 3, pp. 46, illus. 12*).—With respect to vertical motion in relation to frontal wind shear, it is concluded that determination of the change in shear at frontal surfaces by means of the pressure and the pressure tendency field is, in most cases, somewhat unsatisfactory, but moderately quantitative results are obtained with slow moving or quasi-stationary fronts. A method is presented for computing the velocity of a front and therefore of facilitating evaluation of the vertical velocities. Analysis of the wind field at well-defined frontal surfaces appears to indicate that fronts move with a velocity determined by the mean momentum of the cold air normal to the frontal surface. From the known wind field and the computed front velocity it is possible to compute the vertical velocities within the cold and warm air masses at the frontal surface. The level *(H)* where the vertical velocity in the warm air is zero indicates the top of the clouds at the frontal surface. Curves are presented showing some values of *H* corresponding to the wind velocity at 1,400 m. and the velocity at the front; should subsequent investigations prove more conclusively that this general method is applicable to daily weather forecasting, it would probably be advantageous to construct a series of diagrams like the one presented. The forecasting of the presence of clouds and precipitation forms requires an analysis of the convective stability and moisture content of the warm air; if the relative humidities in the

warm air are low, little or no precipitation may occur with the front passage. There is descending motion at the upper portion of all frontal surfaces. The procedure described can be applied to most well-defined cold fronts; in the practical examples given it was frequently found that the upper air data were too uncertain for applying this procedure to warm fronts.

On the basis of the theoretical discussion and empirical evidence presented, the significant conclusions regarding cloudiness and precipitation in relation to convergence are as follows: There is horizontal convergence of the gradient wind when the air motion is from south to north or when the air moves in a curved path; at frontal surfaces the solenoidal field contributes to the convergence or divergence. As a result of horizontal convergence in the lower layers of the atmosphere there are ascending vertical velocities and a stretching of the air columns; this stretching, in general, produces only light drizzle-type precipitation unless the air is convectively unstable. Occurrence of light rain and/or thundershowers during fall, winter, and spring can frequently be explained by the effect of convergence in the horizontal motion in an air mass. Because of isallobaric convergence, cloudiness and precipitation may be expected within regions of isallobaric minima. Frictional convergence near troughs and cyclones contributes to the production of cloudiness and precipitation. Convergence in nongradient flow is apparently difficult to evaluate and consequently the following general practical procedure has been suggested: Plot the 12-hourly potential temperature differences between standard levels, or the elevation between standard potential temperature surfaces, and observe the trend toward stretching or shrinking as indicated by the change in the vertical concentration of potential temperature surfaces.

Monthly Weather Review, [December 1943–February 1944] *(Mo. Weather Rev. [U. S.], 71 (1943), No. 12, pp. 195–212, illus, 11; 72 (1944), Nos. 1, pp. 46, illus. 63; 2, pp. 47–61, illus. 7).*—In addition to meteorological, climatological, solar radiation, and sunspot data, No. 12 contains articles on Preliminary Report on Tornadoes in the United States During 1943, and Totals and Averages, 1916–42 (pp. 195–197), and The Weather of 1943 in the United States (pp. 198-201), both by J. L. Baldwin, and No. 1, Rates of Precipitation From Pseudo-Adiabatically Ascending Air, by A. K. Showalter (p. 1).

Report on the phenological observations in the British Isles from December 1942 to November 1943, H. C. Gunton *(Roy. Met. Soc. [London], Quart. Jour., 70 (1944), No. 304, pp. 32, illus. 4).*—Included are a summary of the weather of 1943 and its effects and a mass of detailed phenological data for plants, insects, birds, and other animals.

Contributions of botanical science to the knowledge of postglacial climates, W. S. Cooper. (Univ. Minn.). *(Jour. Geol., 50 (1942), No. 8, pp. 981-994, illus. 1).*—An address presenting a critical review of the subject, with bibliographic footnotes.

The effect of weather on response of sweet corn to different seed treatments, G. L. McNew *(Canner, 98 (1944), No. 18, pp. 16, 18, 30, 32, illus. 2).*—This paper—based on experimental results described—was prepared to acquaint readers with the general nature of seed diseases of corn and what can be expected from different treatments of ordinary commercial seed stocks in protecting them against both seed- and soil-borne diseases. Since weather changes affect the needs for seed treatment, a series of tests was conducted on five successive dates (May 18–June 19, 1942) using various fixed coppers and some of the newer organic fungicides. All treated sweet corn seed produced much heavier crops than the untreated, but the data obtained for the late plantings differed considerably from those in the early

planting. The organic mercurials were among the most effective, whereas Yellow Cuprocide gave the smallest increase; the leading material for the season was Thiosan, with an average increase of 20 per cent in yield. Further tests made in commercial fields confirmed the evidence obtained in the replicated plat tests. Weather variations affected the results of seed treatment in two ways: The need is most acute when the seeds germinate in cool wet soil, but even under favorable conditions fungicidal applications appear to be profitable. The second effect of weather is exerted directly on the chemicals themselves. The coppers are most effective in cold wet soils, but may even be mildly toxic in warm dry soils. The mercurials appear to be favored by warmer conditions and their effectiveness diminishes with increased rainfall probably because of their solubility. A more consistent behavior, such as that reported for Thiosan, is to be desired because the treatment should be effective under all possible weather conditions. Any of the well-established treatments, such as Semesan Jr., can be depended upon; there are also some promising new materials, such as Thiosan and Spergon, that should be tested in different localities in anticipation of the possibility that they may be recommended to replace the metallic disinfectants now in use.

The effect of the great drought of 1934 on the leaf structure of certain Iowa plants, F. M. and M. E. Turrell. (Calif. Citrus Expt. Sta.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 185-193).*—Leaves of herbaceous and woody species from three widely separated Iowa State parks were found to have developed smaller leaf thicknesses and intervascular intervals in the summer of 1934, under drought conditions, than at the same locations during 1935, when rainfall was normal. At a fourth location—Gitchie Manitau State Park—leaf thickness of herbaceous and woody species was greater in 1934 than in 1935, explainable by the nearly normal water supply there in June 1934 and the drought of 1935. The greater intervascular intervals of 1935 in this area corresponded to the adequate water supply in April of that year and the smaller intervals the following season to the drought of April 1934.

Report submitted to the Trail Smelter Arbitral Tribunal, R. S. Dean and R. E. Swain (*U. S. Dept. Int. Bur. Mines Bul. 453 (1944), pp. 304+, illus. 130.).*—The damage to vegetation in parts of Washington State by sulfur dioxide emitted by smelters at Trail, British Columbia, has been the source of much international litigation. The Arbitral Tribunal set up by the two governments in 1935, believing that an adequate regime based on scientific meteorological criteria might be devised, ordered (1938) that comprehensive studies of atmospheric conditions in the Columbia River Valley near Trail be undertaken. This report presents the results of such an exhaustive study. The first part discusses the details of the plant equipment and procedure which permits the rate of emission of SO_2 to be varied widely while the plant continues in full operation. It is this feature that makes possible the use of meteorological criteria in so governing the output of SO_2 as to avoid damage to vegetation. The second part, by E. W. Hewson and G. C. Gill, discusses in detail the relationship between meteorological conditions in the valley and atmospheric diffusion processes. The general distribution of gas in the valley is first indicated; mean wind conditions are then shown and from these data the transport of gas in the area under average conditions can be seen. Use of geostrophic winds as a method of forecasting winds in the valley for a 6-hr. period is also suggested and discussed in detail. The diffusion of gas in the atmosphere, as contrasted with its transport in a body by the wind where there is little or no attenuation, is considered in the final section. It is shown that turbulence is the main diffusing agency, and its relationship with lapse rate and wind velocity

is indicated. The fundamental facts here considered necessarily form the basis for any operating regime depending on meteorological criteria. The third part of the report gives the provisional operating regimes in force during the investigation, the amounts of S fixed and emitted to the atmosphere, and a summary of data from the permanent recorders. The final regime recommended is described in an appendix.

Utilization of crop residues for wind erosion control, W. S. Chepil (*Sci. Agr., 24 (1944), No. 7, pp. 307-319, illus. 6).*—The severe dust storms throughout the semiarid regions of North America (1931-38) focused attention on the problem of soil erosion by the wind and led to wind-tunnel experiments on the effects of wheat stubble and straw on the erosiveness of 16 widely different soils. Crop residues retained at the ground surface were found to have a marked effect in reducing wind velocity and consequently erosion. The effectiveness of these organic residues in preventing wind erosion was due partly to such reductions in wind velocity, but more particularly to the high value of the residue in trapping the eroding soil. The amount of wheat stubble or straw required to prevent erosion varied with the relative erosiveness of the soil and the velocity of the wind; for the soils and velocities used, the amount varied from nearly 0 to 2.5 tons per acre of stubble retained above the ground surface. The higher the wind velocity, the greater was the amount of crop residue required; to give equal protection the amount of stubble had to be doubled to withstand an increase in velocity of 5 m. p. h. at 1-ft. height. Short stubble afforded less protection than an equal amount of longer stubble. Stubble afforded less coverage to the ground than an equal weight of straw, but was less subject to removal by high winds. When scattered on the surface, mixtures of straw and stubble gave more protection against wind than equivalent amounts of either

SOILS—FERTILIZERS

Base-exchange equilibria in soils and other exchange materials, S. W. Melsted (*Thesis, Univ. Ill., Urbana, 1943, pp. 6+*).—Static and leaching equilibria were investigated. A study of the effect of the concentration of the leaching solution on the final distribution of the ions on the exchange surface definitely showed that as the leaching solution of mixed ions is concentrated the monovalent ions will increase, while the divalent ions will decrease on the exchange surface. A study of the effect of the ratio of the ions in a leaching solution, at constant concentration, on the final distribution of the ions on the exchange surface showed that as the ratio between two ions in solution widened their relative ratio on the exchange surface narrowed. All the natural soils and natural silicate minerals studied preferentially adsorb K from a concentrated leaching solution containing equal normalities of Ca and K. The author suggests from this that when K fertilizers are applied to a soil in a concentrated form the probable leaching losses are not in proportion to the increase in the concentration of the fertilizer added.

Soil and water conservation on orchard lands within the Contra Costa Soil Conservation District, J. B. Rogers. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 17-20).*—This district is in Contra Costa County, Calif., which is just east of the San Francisco Bay area. The average annual precipitation of about 20 in. is distributed over a 3- to 4-mo. period during the winter season, and thus the problem of moisture conservation and erosion control during the period of precipitation is of utmost importance. The following practices have been found effective in conserving soil and water and maintaining and increasing production:

Annual cover crops seeded early in the fall to provide a protective cover for the soil during the rainy season; cover crop residue mulch type of cultivation that will increase water penetration and reduce water runoff and erosion, as well as lowering operation costs and wear on equipment; fertilization with a nitrogen, or nitrogen phosphate, fertilizer to insure a quick growth of the cover crop before the rainy season begins; contour cultivation on all sloping land, especially just prior to the rainy season; diversion terraces and annual grade ditches with proper outlets for the concentrated water; and basin listing on suitable soils and slopes.

Orchard soil management, E. F. PALMER and J. R. VAN HAARLEM (*Ontario Dept. Agr. Bul. 437 (1944), pp. 45, illus. 22*).—A practical discussion and summation of factors important in developing an effective soil management system for orchards. The material and method of presentation are such as to make the bulletin of value to the fruit grower.

Crop succession: A study in land use, G. W. CONREY. (Ohio. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 312-315, illus. 1*).—A land-use survey of Huron County, Ohio, was carried on in connection with a soil survey. The observations cover crops grown in three townships for a 3-yr. period. General farming is the common type of agriculture in the area, and there are many variations within the system. The author concludes that there is opportunity on many farms for a more systematic rotation, especially for rotations including a sod crop.

The comparative effect of corn and sorghums on the yield of succeeding crops, H. E. MYERS and A. L. HALLSTED. (Kans. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 316-321, illus. 1*).—Crop yields following corn and sorghums at both Hays and Manhattan, Kans., are reported, together with the nitrate nitrogen content of corn and sorghum soils at oat- and wheat-seeding time at Manhattan. The detrimental effect of a previous crop of sorghum on the yield of winter wheat is relatively great as compared to the yield of wheat following corn. The detrimental effect of a previous crop of sorghums on the yield of spring-seeded crops is considerably less than on fall-seeded crops and may be entirely nonexistent. At Manhattan a rotation including alfalfa or sweetclover was effective in overcoming the depressing effect on the yield of spring-seeded crops. Soybeans, on the other hand, were not effective in overcoming the unfavorable effect of sorghums. Thus, the relative supply of nitrate nitrogen available to the succeeding crop appeared to be an important factor in determining the effect of sorghums on yield of crops in the higher rainfall area of the State.

At Hays soil moisture differences will explain much of the difference in yield of wheat following sorghums as compared to the yield following corn. At the Fort Hays Substation the yield of the preceding row crop was inversely related to the yield of wheat immediately following the row crop. The relationship was highly significant statistically. Winter wheat following sorghums resulted in less depression in yield than wheat following weeds.

Mulch farming, G. B. NUTT and T. C. PEELE. (Coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1943, pp. 16-22, illus. 5*).—A progress report on mulch farming, which involved various methods of handling crop residues and cover crops, showed that when residues were maintained on the soil surface they were much more effective than when organic matter was incorporated in the soil in reducing runoff and erosion. The different tillage methods had no significant effect on the yield of corn.

Investigations in erosion control and reclamation of eroded land at the Palouse conservation experiment station, Pullman, Wash, 1931-42, G. M. HORNER, A. G. MCCALL, and F. G. BELL. (U. S. D. A. coop. Wash. Expt.

Sta.). (*U. S. Dept. Agr., Tech. Bul. 860 (1944), pp. 83+, illus. 27*).—This report upon more than 10 yr. work of one of the conservation experiment stations is intended as a manual or handbook for soil- and water-conservation technicians. It constitutes a guide for determining degrees of slope for terrace channels on certain soils, the vertical fall between terrace crests, the expectancy of protection to be derived from various kinds of cover crops on different soils and slopes, the amount of water likely to be conserved from the average rains for crop use under various conditions of slope and soil treatment, etc. The contents of the bulletin are in part a discussion of the problem area, including its erosion and runoff history; a description of the station; a statement of the purpose and plan of the experiments covering measurement of erosion losses, other investigations, and contributing records; experiment results dealing with rainfall characteristics and erosion, effect of plant cover, effect of crop rotations, soil erodibility, moisture studies, tillage practices, terracing studies, and watershed areas; a discussion of these results; and an appendix containing observational data describing important seasonal and daily conditions.

Plant nutrient and water losses from Fayette silt loam as measured by monolith lysimeters, V. J. Kilmer, O. E. Hays, and R. J. Muckenhirn. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 3, pp. 249-263, illus. 4*).—Percolation rates and plant nutrient losses from Fayette silt loam are given when fallowed and when cropped to corn. Lysimeter measurements were made under the fallow and corn conditions, in one case with runoff permitted and in the other not permitted. Plant nutrients determined in the percolate, when arranged in order of decreasing amount of loss by leaching, were as follows: Calcium, magnesium, sulfur, potassium, and phosphorus. Losses by leaching were small even when at their maximum as a result of fallowing and the prevention of runoff. During a 3-yr. period when runoff was permitted, cropped lysimeters lost an annual average of 21 lb. of calcium oxide per acre, while under fallow conditions they lost 53 lb. per acre per year. Annual magnesium oxide losses were 10 and 31 lb. per acre from cropped and fallowed lysimeters, respectively. The annual loss of sulfur, in terms of SO_3, was found to be 2 lb. per acre from cropped lysimeters and 7 lb. per acre from uncropped lysimeters. Potassium oxide and phosphorus losses were negligible. Plant nutrient losses from fallowed lysimeters which permitted no runoff were found to be from two to four times as great as from fallowed lysimeters which permitted runoff.

Lysimeters with a 10-percent slope planted to corn and permitting runoff lost an average of 0.8 percent of the precipitation by percolation, while similar fallowed lysimeters lost 3.8 percent. With fallowed lysimeters during 1940 and 1941, water loss by percolation when runoff was prevented averaged 20 percent of the precipitation; when runoff from a level surface was permitted it averaged about 9 percent. No significant difference in surface runoff was noted between soil monoliths having a continuous soil profile and lysimeters having drainage pans. The amount of water intake into the soil with these two types of installations was, therefore, nearly equal in amount.

The mineralogy of soil colloids, G. Nagelschmidt (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 42 (1944), pp. 33+, illus. 2*).—A comprehensive review and presentation of data on the crystal structures of clay minerals, technic for investigation, description and properties of minerals in soil colloids, weathering of feldspars and formation of clay minerals in the laboratory, and a consideration of the pedologic and agronomic application of information on clay mineralogy.

Soil and fertilizer investigations, E. M. Roller and A. B. Brown. (Coop.

U. S. D. A.). (*South Carolina Sta. Rpt. 1943, pp. 115-124, illus. 5*).—Lysimeter studies reported include agronomic and chemical investigations of both winter and summer green manure crops grown on Norfolk coarse sand. Data are presented on percolates obtained from lysimeters under several different management systems. The importance of a soil management system that will increase the power of the soil to retain soluble plant food is discussed.

The plow-under method of applying fertilizer, C. E. Millar (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 173-176*).—Results from 11 yr. of experimentation revealed an average yield of 35.85 bu. of corn per acre where the fertilizer was placed on the bottom of the furrow and 39.0 bu. where it was broadcast on the surface and plowed under. Applying fertilizer in the row was followed by a yield of 40.94 bu. Putting the fertilizer on the bottom of the furrow was the poorest of eight methods tried. The author points out that results of these and other experiments reported with sugar beets and soybeans do not offer a basis for the conclusion that applying fertilizer by means of the recently developed attachment to the plow is a very effective means of using large or moderate quantities of fertilizer. It is also suggested that the experiments are not sufficiently extensive to warrant the conclusion that this method of fertilization has no merit.

Getting the most out of fertilizers, D. W. Thorne and H. B. Peterson (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 1, pp. 1, 8-9*).—The importance of the selection of proper fertilizers for obtaining maximum production is given emphasis. Specific recommendations are made on the fertilizer to be used for various crops, and suggestions given on methods and time of application.

Adjusting soil and cropping programs to the nitrogen shortage (*Soil Sci. Soc. Amer. Proc., 7 (1942) pp. 294-311*).—A series of four papers discussing the national problems related to soil nitrogen is presented.

Making the most of our nitrogen resources, F. E. Bear (pp. 294-298) (N. J. Expt. Stas.).—This paper covers the eastern United States. The nitrogen supplied to crops from commercial fertilizers represents a very small fraction in considering the economy of this element in the soil. The effect of different cropping systems on the nitrogen balance of the soil is given consideration. Looking into the future, the author points out that legumes probably will continue to be the primary source of soil nitrogen.

Nitrogen problems in the Southern States, N. J. Volk (pp. 299-300) (Ala. Expt. Sta.).—A nitrogen shortage in the South presents a serious problem, for it is estimated that the application of an adequate supply of nitrogen to the average Alabama soil will usually double the yield of major nonlegume crops. As possible methods of meeting the nitrogen shortage, the author proposes the use of winter legumes, summer legumes, liming, use of cottonseed meal, and a general educational program.

Nitrogen problems in the Midwest, F. C. Bauer (pp. 301-308) (Ill. Expt. Sta.).—Considering problems of nitrogen shortage under a war economy, the author makes the following conclusions: Shortages of chemical nitrogen can be offset by allocating existing supplies wisely, making more effective use of farm resources, and using crop species, varieties, and strains adapted to later planting in the spring. Intensified cropping of highly productive soils may be considered for wartime conditions. Intensive cropping should be carried out with caution. It may encourage the development of insect and disease hazards and allow weather extremes to reduce the usefulness of large areas of land. In wartime there is need for a diversity of agricultural products. The best way to produce them is through diversified and balanced cropping systems. Quality and yields will be higher and contribute more to the war effort if this is done. A smoothly running producing system is always in order. This is es-

pecially true in wartime when the need for quality products is intensified and manpower decreased. Any drastic let down in plans to replenish nitrogen will soon be reflected in lowered crop quality and yields. With a continuing war and great post-war needs, the national economy will suffer.

Nitrogen problems in the far West, S. C. Vandecaveye (pp. 309-311) (Wash. Expt. Sta.).—The author gives special consideration to avoiding overgrazing of the grazing lands in connection with the increased livestock production program, adopting a moderate increase in leguminous green manure cropping in those areas of dry-land farming where the annual rainfall is 18 in. or more, and practicing well-planned rotations of sugar beets and potatoes with alfalfa in those irrigated areas where these crops are produced extensively. A considerable part of the commercial nitrogen now used for the large acreage in citrus and stone fruits could be substituted by fixed nitrogen derived from leguminous cover crops if these crops were introduced in citrus groves and produced more extensively in stone fruit orchards. Because of the difficulties involved in obtaining satisfactory stands of leguminous cover crops in old apple orchards, no substantial increased substitution of commercial nitrogen by these cover crops can be expected in the near future in these orchards. Owing to the sharply increased demand for vegetable crops and the cost involved in growing leguminous cover crops in connection with the production of vegetable crops, it appears that more rather than less commercial nitrogen will be needed to meet the requirements of the proposed vegtable production program.

Nitrous acid and the loss of nitrogen, J. K. Wilson ([*New York*] *Cornell Sta. Mem. 253 (1943), pp. 36, illus. 8*).—A study was made to ascertain the part taken by nitrite or by nitrous acid in the natural loss of combined nitrogen. The reaction apparently occurs throughout nature. Urea, ammonia, amines, peptones, peptides, and compounds containing no nitrogen, such as glucose and formaldehyde, may react with nitrous acid to cause a loss of combined nitrogen.

It was determined that the nitrite naturally present in the exudative water from plants disappears more quickly when the water contains a compound such as ammonia or urea, with which the nitrite can react, or when such a compound is added. It was observed that when the exudation from bluegrass contains equal quantities of nitrite and ammonia, both disappear equally. In similar tests, where one was in excess of the other, both disappeared to an extent equivalent to the smaller quantity. The quantity of the one in excess remained for a considerable time. The data concerned with the part played by the nitrite in the juice of plants, as well as that in the exudative water from plants in the natural loss of nitrogen, led to the conclusion that the Graminae have the same effect as the bacteria, as far as the reduction of nitrate is concerned. While they may not produce gaseous nitrogen, as such, from nitrate, they do reduce the nitrate in the process of assimilation to nitrite. Some of the nitrite may appear as nitrous acid, owing to the presence of hydrogen ions, and thus react with several substances either in the plant or in its exudate to cause a chemical loss of nitrogen. Such conditions may be effected also by algae.

The universality of this reaction in nature is emphasized. It is suggested also that the large, unaccountable loss of nitrogen reported in fertility studies over a period of 75 yr. must be accounted for by reactions of nitrite in the exudative water from plants.

A list of 98 references is appended.

Adsorption and release of phosphate ion by soils and clays, L. T. Kurtz (*Thesis, Univ. Ill., Urbana, 1943, pp. 7*).—The trend of phosphate adsorption in widely different Illinois soils was found to be so similar that the same reactions were assumed to be taking place and the same mechanisms of adsorption operating in all

cases. This study shows that phosphate fixation in Illinois soils does not constitute an argument against the practicability or advisability of using soluble phosphate in fertilizers, and it also shows that the loss of phosphate from crop utilization because of its reactions with soil is not as serious as was formerly believed.

The effect of mycorrhizal and nonmycorrhizal fungi on the availability of difficultly soluble potassium and phosphorus, R. O. ROSENDAHL. (Univ. Wis.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 477-479, illus. 1*).—Red pine and American elm seedlings were raised in sand cultures supplied with 40-60-mesh orthoclase and apatite as the only respective sources of K and P. Pines grown in sand-orthoclase media inoculated with *Boletus felleus* showed much larger growth and K absorption than control seedlings or those inoculated with *B. granulatus* or *Amanita muscaria*. *B. felleus*-inoculated seedlings, transplanted to a mycorhiza-free prairie soil developed mycorhizas and exhibited larger growth and survival than other seedlings. Elm seedlings in sand-orthoclase media were not stimulated by any fungi tried, but their growth in sand-apatite media was increased by the presence of mycorhizal and nonmycorhizal fungi alike. Chemical analyses of these sand cultures indicated that both mycorhizal and nonmycorhizal fungi increased the solubility of the P of apatite. No increase in the solubility of K of the orthoclase, however, was detected by extraction with weak H_2SO_4 solution.

Effect of sulphur particle size and of aluminum sulphate on rate of soil acidification, J. C. RATSEK. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 281-283, illus. 2*).—This investigation was conducted to determine the best mesh of sulfur to be used for soil acidification from the standpoint of both efficiency and economy. A black waxy calcareous prairie soil of the San Saba series was used in the studies. Sixteen-mesh sulfur was found to be the best for use as a soil acidifier. The presence of an excess of nitrogen greatly hastened the rate of oxidation of sulfur in the soil. One lb. of sulfur will acidify a given volume of soil to the same degree as 7 lb. or more of aluminum sulfate.

The copper, manganese and zinc content of subterranean clover and oats in Western Australia, L. J. H. TEAKLE and A. G. TURTON (*Jour. Dept. Agr. West. Austral., 2. ser., 20 (1943), No. 3, pp. 238-259, illus. 1*).—This survey of the Cu, Mn, and Zn contents of subterranean clover, oats, wheat, and barley grown on soils over a considerable portion of the agricultural areas of the State indicates Cu deficiency to be general in certain districts. Instances of Cu deficiency are widely scattered over the whole of the agricultural areas investigated. The better class soils are almost invariably well supplied and sandy loam soils are usually at least moderately so; in the majority of cases Cu deficiency is associated with sandy and gravelly soil types, but only certain classes of these soils appear to be low in Cu. Mn deficiency does not appear to be general in Western Australia, but analyses of subterranean clover and the cereals indicate that Zn deficiency may occur on a number of light soil types.

Potassium-boron and calcium-boron relationships in plant nutrition, E. REEVE and J. W. SHIVE. (N. J. Expt. Stas.). (*Soil Sci., 57 (1944), No. 1, pp. 1-14, illus. 6*).—External symptoms of boron toxicity at high boron levels, like deficiency symptoms at low boron levels, are progressively accentuated with increasing potassium concentrations in the nutrient substrate. At any given boron level in the substrate there was a progressive increase in the boron content of the plants as the potassium concentration in the substrate increased, especially at the high boron levels. Calcium and potassium were found very similar in their capacity to accentuate the symptoms of boron deficiency with increasing concentrations of these cations in the nutrient substrate. Boron toxicity at the high boron levels

decreased markedly with increasing concentrations of calcium, however. In this respect the influence of calcium is opposite to the accentuating effect of potassium. At the high boron levels there was a marked decrease in both total and soluble boron in the plant tissue with increase in the calcium concentrations in the nutrient substrate. Calcium accumulation in the tissues was largely determined by its concentration in the substrate and appeared independent of boron. At any given calcium and boron level, within limits, the Ca : B ratio decreased markedly with increase in the potassium concentration of the nutrient substrate. Calcium, on the other hand, within the limits of the experiments reported upon, had little or no significant effect upon the K : B ratio values.

The calcium-boron balance in plants as related to boron needs, H. E. Jones and G. D. Scarseth. (Ind. Expt. Sta.). (*Soil Sci., 57 (1944), No. 1, pp. 15-24, illus. 2*).—In greenhouse pot experiments in which borax was added in varying proportions to limed and unlimed soils and the crops analyzed for calcium and boron, it was found that plants will take up quantities of calcium and boron depending upon the availability of these elements in the soil. From plant analyses it appeared that each plant has a specific need for calcium and boron, but the range varies greatly among crops. The plant will make a normal growth only when a certain balance in the intake of calcium and boron exists. If this balance is upset by a small intake of calcium, as on acid soils, the plant will have a very low tolerance for boron. On strongly acid soils that contain a small quantity of available calcium, small additions of borax applied to the soil may cause boron injury. On soils of the humid region that have a very high calcium content, as alkaline or overlimed soils, the plants require more boron than on the acid soils. On such alkaline soils the balance in the calcium and boron relationship tends to be upset by the excess calcium the plants have absorbed. On overlimed Indiana soils the plant may require more boron than is available (see also work at the Vermont Experiment Station on overliming injury (E. S. R., 68, p. 598)). Boron can be added in larger quantities on alkaline or limed soil without causing any injury or toxic effect than when added to acid soils. Farmers should be on the lookout for boron starvation particularly on overlimed or alkaline soils and should be careful not to add overdoses of borax to acid soils.

The ideal balance between calcium and boron for tobacco appeared to be about 1,200 of calcium to 1 of boron, in terms of equivalent weights of the two elements. For soybeans the ratio of calcium to boron was about 500 and for sugar beets about 100.

Chemical and biological studies on aqueous solutions of boric acid and of calcium, sodium, and potassium metaborates, W. E. Colwell and R. W. Cummings. (Cornell Univ.). (*Soil Sci., 57 (1944), No. 1, pp. 37-49, illus. 3*).—A study of aqueous solutions was made in pure chemical systems and in relation to absorption of boron by plants. Specific conductance was determined in increasingly dilute solutions of calcium, sodium, and potassium metaborates and of sodium tetraborate, and the ionic conductance of the anion was calculated. For the sodium and potassium salts this value was about 33, which corresponds with the accepted value for the H_2BO_3 anion. For the calcium salt this value was lower and the system showed a gradual lowering of the conductance values and of pH toward neutrality. In electrodialysis of these metaborates through cellophane membranes, boron migrated as part of an anion at somewhat different rates for the three salts but its behavior was not markedly different. Studies on the solubility of calcium metaborate showed that the boron content of the supernatant liquid depends upon the quantity of excess solid present and on the time of contact. Concentrations of 650 p. p. m. B were

obtainable when an excess of 30-40 gm. was in contact with approximately 100 cc. water for 6 mo. On the other hand, with periodic shaking, 0.2455 gm. CaB_2O_4 per liter (42.3 p. p. m. B) did not all dissolve in 41 days. The solution of calcium metaborate is not in accordance with true solubility behavior. Hydrolysis similar to that known to occur in calcium metaphosphate systems may be a factor of importance in aqueous solutions of calcium metaborate. The slow solution rate of calcium metaborate undoubtedly has considerable practical significance.

In a water culture experiment with the sunflower, the absorption of boron from aqueous solutions of boric acid and of calcium, sodium, and potassium metaborates showed that the quantity of boron absorbed by the plant was related to the concentration of boron in the substrate and to the time of absorption and not to the salt which furnished it. In sand cultures to which 0.25 p. p. m. B was added from solutions of boric acid and of calcium, sodium, and potassium metaborates, boron-deficiency symptoms appeared when the cultures were about 25 days old, regardless of the source of boron. In a comparable series to which 2.05 p. p. m. B was added, toxicity symptoms appeared after approximately 20 days, regardless of the source of boron. It is concluded that the absorption of boron by plants does not depend upon its source so long as the water-soluble concentration is the same.

Functional relationships between boron and various anions in the nutrition of the tomato, J. R. Beckenbach (*Florida Sta. Bul. 395 (1944), pp. 34, illus. 8*).—Rutgers tomato plants were grown in sand culture under a factorial split-plat design to determine possible interactions between nitrate level and boron requirement and phosphate level and boron requirement. More boron was required by plants growing in solutions containing ample nitrates than was required by nitrate-deficient plants. Plants grown with solutions deficient in phosphates required more boron than plants receiving ample phosphates. The theory is presented that the phosphate and borate ions may function interchangeably as essential juice buffers, or in precipitating out excess cations which form relatively insoluble salts with these ions, or in both of these functions.

AGRICULTURAL BOTANY

Cornell University abstracts of theses, 1942 (*Ithaca, N. Y.: Cornell Univ. Press, 1943, pp. 348-351, 354-357, 361-362, 373-374, 390-395, 400-403, 407-409*).—The following are of botanical interest: Carbohydrates and Amylases in the Endosperm of Corn, by L. Bernstein (pp. 348-351); A Physiological Study of Embryo Dormancy in the Seed of Native Hardwoods and Iris, by L. G. Fox (pp. 354-357); A Cytological and Genetic Study of Primary Trisomic Types in *Zea mays,* by J. Einset (pp. 361-362); A Study in the Identification of Weeds in the Vegetative Condition, by D. Isely (pp. 373-374); Some Factors Influencing Acid Changes in Leaves of *Kalanchoe* (*Bryophyllum*) *daigremontiana,* by G. F. Somers, Jr. (pp. 390-392); The Yeast Flora of New York State Wine Grapes, by F. W. Tanner, Jr. (pp. 393-395); Linkage in Autotetraploid Maize, by J. E. Welch (pp. 400-403); and A New Interpretation of Coniferous Cones With Special Reference to the Podocarpaceae, by M. H. Wilde (pp. 407-409).

Division of plant biology, H. A. Spoehr et al. (*Carnegie Inst. Wash. Yearbook, 42 (1942-43), pp. 71-104*).—Summaries of progress in the following fields of research in plant science are presented: Biochemical Investigations, by H. A. Spoehr, J. H. C. Smith, H. H. Strain, W. M. Manning, H. W. Milner, and G. J. Hardin (pp. 75-91), includes studies on the biochemistry, selection and isolation, and pigments of algae; effect of environment on the pigment content of algae, properties

of chlorophylls, production of organic matter by *Chlorella pyrenoidosa,* vitamins in algae, photosynthesis in sunflower leaves, improved methods of pigment analysis, and new sources of cis-lycopene. Experimental Taxonomy, by J. Clausen, D. D. Keck, and W. M. Hiesey (pp. 91-100), considers the biosystematic units, evolutionary sequences, success or failure of amphiploids, range and forage grasses, and miscellaneous studies. Desert Investigations, by F. Shreve (pp. 100-103), and Paleobotany, by R. W. Chaney (p. 103), are also included.

Origin and significance of plant names, H. W. Shimer (*Hingham, Mass.: South Shore Nature Club,* 1943, *pp. 60*).—The author discusses the origin of some of our common plant names and their place in the evolution of the English language, including the Indo-European homeland, Anglo-Saxon beginnings, middle English and the French influence, and the English language in America. The meanings underlying plant names are considered as regards the origin of common names, animals in plant names, religion and medicine in plant names, origin of scientific names, and some common genera named in honor of men. An index of plant names includes the derivations of some not noted in the pamphlet.

Practical plant biology: A course of elementary lectures on the general morphology and physiology of plants, H. H. Dixon (*Dublin: Hodges, Figgis & Co., 1943, 2. ed., pp. 337+, illus. 111*).—This is the second edition of a book previously noted (E. S. R., 48, p. 192).

A method for collection of bacteria from air and textiles, H. M. Lemon (*Soc. Expt. Biol. and Med., Proc., 54 (1943), No. 3, pp. 298-301, illus. 1*).—Airborne bacteria are collected by means of dispersing air at a rate of 30 l. per minute from a Folin aeration tube into 20 cc. of broth contained in a test tube. The apparatus is said to be about 90 percent efficient, is readily constructed, and may be adapted to estimating the bacterial content of textiles.

New indicators to replace litmus in milk, J. A. Ulrich. (Univ. Minn.). (*Science, 99 (1944), No. 2574, p. 352*).—Search for a single compound to serve as indicator for both pH and E_h in the proper ranges having proved disappointing, resort was had to a combination of indicators. Those embodying the most desirable properties were Chlor Phenol Red (or Brom Phenol Red) for pH and Methylene Blue for E_h; procedures for their use are given, as well as for transposing the same reactions found on litmus milk.

Aerobic decomposition of cellulose by thermophilic bacteria, H. C. Murray. (Purdue Univ.). (*Jour. Bact., 47 (1944), No. 2, pp. 117-122*).—Cultures of bacteria were readily obtained from soil and ruminant feces which attacked filter paper aerobically at 60° C.; they were inhibited by several anaerobic methods. Growth in agar media was very markedly affected by the relative humidity of the incubator atmosphere.

Chlorellin, an antibacterial substance from Chlorella, R. Pratt, H. A. Spoehr, et al. (Univ. Calif. et al.). (*Science, 99 (1944), No. 2574, pp. 351–352*).—The results of numerous experiments over 1.5 yr. show that an antibacterial substance accumulates in uncontaminated cultures of *Chlorella* (*C. vulgaris and C. pyrenoidosa* used) and that its activity can be tested by standard bacteriological methods. Though the products thus far obtained represent only crude extracts, the substance is designated "chlorellin" for convenience of reference. It is unique in the growing list of antibiotics because, being derived from an autotrophic organism, its production does not entail the use of organic culture media, only inorganic salts, CO_2, and light being required.

Claviformin from Aspergillus giganteus Wehm., H. W. Florey, M. A. Jennings, and F. J. Philpot (*Nature [London], 153 (1944), No. 3874, p.*

139).—A brief note calling attention to the results from various workers as showing that claviformin is now known to be produced by at least four fungus species, including *A. giganteus*.

Studies on Aspergillus flavus.—II, The production and properties of a penicillin-like substance—flavacidin, C. M. McKee, G. Rake and C. L. Houck. (*Jour. Bact., 47 (1944), No. 2, pp. 187-197, illus. 1*).—In continuation (E. S. R., 89, p. 639), *A. flavus* produces under certain conditions a substance flavacidin which resembles penicillin, submerged growth in a modified Czapek-Dox medium with agitation and aeration proving most suitable for its formation. The biological characteristics of the two substances are similar, viz, in their high activity against gram-positive and relative inactivity against gram-negative organisms, equal protection of mice against pneumococci, high solubility, similar effects on resistant cultures, and in their reactions to enzymes.

Penicillin.—I, Methods of assay, W. H. Schmidt and A. J. Moyer. (U. S. D. A.). (*Jour. Bact., 47 (1944), No. 2, pp. 199-209, illus. 7*).—In giving procedures for assay of penicillin by the cylinder plant and serial dilution methods, a number of factors influencing the former are listed and discussed, viz., depth of agar, stock culture of test organism, pH of medium, relationship of diffusion rate of penicillin to growth of test organism, concentration of inoculum, and condition of ground glass surface of cylinder. Under the conditions described it was determined that it takes about 0.045 Oxford unit per cubic centimeter or broth to inhibit growth of the test organism at 18 hr., and 0.1 unit at 40 hr.

Illustrations of the fleshy fungi of Iowa.—V, The pink-spored agarics, J. C. Gilman. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 159-163, illus. 7*).—A continuation of the series (E. S. R., 90, p. 26).

Some of the available hepatics and their location in the vicinity of Iowa State College, J. N. Martin. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 229-234, illus. 8*).

Illustrated flora of the Pacific States—Washington, Oregon, and California.—II, Polygonaceae to Krameriaceae—buckwheats to kramerias, L. Abrams (*Stanford University, Calif.: Stanford Univ. Press; London: Oxford Univ. Press, 1944, vol. 2, pp. 635+, illus. 1663*).—This is the second of a four-volume series, of which the first has been previously noted (E. S. R., 84, p. 594).

A contribution to our knowledge of the wild and cultivated flora of Ohio, I, H. N. Moldenke (*Castanea, 9 (1944), No. 1-3, pp. 81+*).—This paper comprises an annotated list of 2,734 collections of Ohio plants representing some 1,315 species, varieties, and forms in 699 genera and 236 families. Cultivated species, escapes, naturalizations, and waifs are included, as well as native material; these facts and other essential data are stated wherever confusion would otherwise result. Most of the records are based on material found on or near land owned or leased by the North Appalachian Experimental Watershed.

Quantitative investigations on the reaction of yeast to certain biologically active substances, A. Levan and C. G. Sandwall (*Hereditas, 29 (1943), No. 1-2, pp. 164-178, illus. 1*).—The authors investigated the reactions of yeast to know concentrations of colchicine, acenaphthene, α- and β-monochloronaphthalene, α-naphthaleneacetic acid, camphor, and borneol. The first two, even in strong concentrations, had no effect on cell propagation or lethality; saturated concentrations of the other substances varied in their poisonous effects. The conditions of the specific camphor reaction were determined; it was induced by camphor and borneol and to a small extent also by naphthaleneacetic acid. The most active concentrations for

induction of the camphor forms were 0.006–0.007 M camphor and 0.0035–0.0045 M borneol. Some particulars concerning the development and morphology of the camphor forms are given, and the camphor reaction of yeast is discussed in relation to the c(= colchicine)-mitosis and c-tumor reaction of higher plants.

The relative humidity at leaf surfaces, C. E. YARWOOD and W. E. HAZEN. (Univ. Calif.). (*Amer. Jour. Bot., 31 (1944), No. 3, pp. 129-135, illus. 5*).—The relative humidity at a leaf surface is considered to be equal to that at a homogeneous surface losing water at the same rate and under the same environment, when radiation is not an important factor. The quantitative relation between temperature and relative humidity at surfaces which gain or lose water vapor is presented, and a basic equation is derived for determining the relative humidity at a surface when the temperatures there and at a free-water surface are known. Within the limits of experimental error, observations agreed with the theory for relations between the humidity given by different solutions, the rate of water loss from or absorption by these solutions, and the temperature depression given by these solutions when used as wetting agents for the jackets of wet-bulb thermometers. Linear approximations used for calculating the relation between relative humidities greater than the air and temperature depression at the surface gave values 0–5 percent greater for the former than expected from the basic equation for the test conditions. Leaf surface temperatures were measured by clamping a leaf to a bulb of a thermometer and noting the lowest temperature. Since a fairly straight line relation was observed when the measured rate of water loss from various leaf surfaces and from water was plotted against the observed temperature depression of these surfaces, it was concluded that net radiation to or from the leaf was not important under the conditions used. When a detached bean leaf was vigorously fanned the leaf temperature decreased, though no effect on transpiration was observed. From measurements of the temperature depression of various leaves the relative humidity at these surfaces was calculated by a formula given. The surface relative humidity was higher for young than for old bean leaves, higher for the lower than for the upper surfaces of bean, cucumber, potato, hop, *Pittosporum,* and almond leaves, and higher for bordeaux-sprayed than for untreated bean leaves. In a laboratory at 22° C. and 51 percent relative humidity, the relative humidity at various leaf surfaces varied from 52 percent for the upper surface of old *Pittosporum* leaves to 83 percent for the lower surface of bordeaux-sprayed young bean leaves.

Studies on foliar hydration in the cotton plant.—V, A further experiment with potassium, E. PHILLIS and T. G. MASON (*Ann. Bot. [London], n. ser., 7 (1943), No. 28, pp. 391-397, illus. 2*).—In the first paper (E. S R., 88, p. 605), the relationship between changes in K supply and foliar hydration were considered; in continuation of the series (E. S. R., 89, p. 644), plants were grown with varying K supply under "wet" and "dry" conditions, and the dry weight of the whole plant, hydration in the leaf and bark in terms of dry weight and of protein, and the specific conductivity of leaf and bark sap were determined. Under both wet and dry conditions it was found that as long as increases in K caused little or no further increases in dry weight an increased K supply caused increased hydration. Since the last was associated with increased sap concentration, the effect of K on hydration falls into line with the salt concentration hypothesis of hydration. Size of plant in itself affected hydration of the leaves under dry conditions; it also influenced hydration under wet conditions as the plants aged, possibly because of an increase in resistance to water movement within the plant. Hydration in the bark underwent very similar changes to those in the leaf blade in response to changes in the K supply.

Studies on the partition of the mineral elements in the cotton plant.—IV,

More about nitrogen, phosphorus, and labile carbohydrate, T. G. Mason and E. Phillis (*Ann. Bot. [London], n. ser., 7 (1943), No. 28, pp. 399-408, illus. 4.*).—In continuation (E. S. R., 88, p. 605), the relation between crystalloid- and protein-N was investigated in an experiment where the N supply was varied from acute starvation to considerable excess. The crystalloid-N concentration (dry weight basis) rose continuously with increasing supply, whereas the protein concentration rose to a maximum and then declined. The relation between the two forms of N followed an adsorption (apolar) pattern. In a second experiment, the P supply was varied from acute starvation to excess. The concentrations of both sap-soluble and sap-insoluble P rose continuously with increasing supply. It had been anticipated from previous work that insoluble P would decline as the P supply reached high levels, but such did not occur here. The data from this and previous experiments considered together harmonize with the view that the relation between soluble and insoluble P is of the same type as that between crystalloid- and protein-N. The relation between these two N forms remains relatively constant from one experiment to another in spite of widely divergent conditions, but this does not appear to be so for P, where the soluble/insoluble P relation changes markedly between experiments. It is pointed out that most of the N in the leaf is organic, whereas much of the P occurs as phosphates. It is also shown that the relation between starch and sugar is controlled by factors quite unlike those prevailing for N and P.

The effect of some purines and related compounds on the seedling growth of Avena sativa L., R. F. Jones and H. G. Baker (*Ann. Bot. [London], n. ser., 7 (1943), No. 28, pp. 379-390, illus. 2*).—When oats seedlings were grown in darkness at 25° C. there was a very high correlation between total root length and the length of the longest root. Root growth after treatment with various solutions was expressed as a percentage of the root growth in tap water. This value was generally slightly lower (i. e., inhibition appeared to be greater) when calculated on the longest root length basis, though this phenomenon became less marked as the percentage growth value approached 100 percent. Adenine, hypoxanthine, xanthine, guanine, uric acid, and allantoin were tested for their effects on root and coleoptile growth. Adenine caused detectable inhibition of root growth at about 5×10^{-4} M—the effect increasing with concentration. For uric acid, a percentage growth value of about 67 percent was found at 5×10^{-5}M, but this value was not altered with increasing concentration. A similar value was found for uric acid neutralized before making up to volume with tap water, but here also at about 5×10^{-4} M the percentage growth value of about 68 percent could not be changed even with a concentration of 1.75×10^{-3} M. There was no significant stimulation of root or coleoptile growth by any of the purines tested. Guanidine carbonate did not inhibit root or coleoptile growth at about 5×10^{-4} M, whereas with urea no inhibition of root growth below 1×10^{-1} M was found. Creatine and creatinine both inhibited root growth at 5×10^{-3} M.

Relationships between phosphorylation and photosynthesis in Chlorella, R. L. Emerson, J. F. Stauffer, and W. W. Umbreit. (*Univ. Wis.*). (*Amer. Jour. Bot., 31 (1944), No. 2, pp. 107-120, illus. 3*).—This study considers the theory of photosynthesis involving the basic assumption that absorption of light energy by the chlorophyll system results in forming "energy-rich" phosphate. Several advantages of this hypothesis are described along with certain suggestions as to the type of studies which might prove profitable. It was shown that phosphorylation existed in *C. pyrenoidosa* cells in that they or preparations therefrom were able to oxidize phosphorylated compounds and to phosphorylate nonphosphory-

lated materials. It was shown, however, that the phosphorylated systems involved in the alga are not entirely the same as those in animal or bacterial cells, and that the alga, and perhaps other plants, probably contain a phosphorylative metabolism differing in kind from that of animals. Since the pathways through which the phosphorylative energy is carried are unknown, not too much can be done by means of the study of phosphorylations caused by light until more accurate methods become available. Nevertheless, it could be shown that light and the presence or absence of CO_2 do cause changes in the distribution of the P compounds. The light, in the absence of CO_2, results in a decrease in the amount of "barium-insoluble" resistant P compared to the dark, whereas, in the presence of CO_2, the light results in an increase in this fraction compared to the dark. Sufficient evidence is therefore believed to be at hand to indicate it quite possible that the function of the light energy in photosynthesis is the formation of "energy-rich" phosphate.

Untersuchungen über die biologische Wirkung der durchdringenden Strahlung der Elemente [Investigations of the biological action of penetrating radiations of the elements], D. Fehér (*Erdészeti Kisérletek, 44 (1942), No. 9, pp. 39, illus. 45*).—The author presents his findings over an 8-yr. period from an investigation of the biological radiation power of 69 elements hitherto not studied, in which he used a physiological stimulation method developed by him and here described. As a result of this work he claims by suitably applied nutritional experiments to have demonstrated this action of the elements (provisionally called "bioradiation") on the growth and assimilatory metabolism of the higher plants. This short-wave radiation was related to the mass of its source, and its power was inversely proportional to the square of the distance. Moreover it was found to be a specific property of the elements which always remained constant when they were present in their compounds. Since it has not thus far been possible to catch these rays by purely physical methods, their closer characterization was accomplished by absorption experiments with lead, using the biological method of measurement referred to above.

Pollination in Tsuga pattoniana and in species of Abies and Picea, J. Doyle and A. Kane (*Roy. Dublin Soc., Sci. Proc., n. ser., 23 (1943), No. 7, pp. 57-70, illus. 24*).—The authors present the results of observations in relation to pollen reception and behavior in these members of the Pinaceae.

Preliminary studies of the physiology and morphology of the germinating foliar embryos of Bryophyllum calycinum, J. H. Craft (*Iowa Acad. Sci. Proc., 50 (1943), pp. 171-179, illus. 6*).

Uber den Feinbau der Zellwände höherer Pflanzen [Minute structure of cell walls in the higher plants], W. Wergin (*Biol. Zentbl., 63 [1943], No. 7-8, pp. 350-370, illus. 17*).—In this critical review (43 references, including studies by the author), an attempt has been made to summarize and illustrate the essential facts necessary in drawing a concrete picture of the microscopic structure of the cell walls in the higher plants.

Cellulose acetate as a mounting medium for acetic smears, I. Elvers (*Hereditas, 29 (1943), No. 1-2, pp. 87-90, illus. 2*).—The ordinary acetocarmine smear method for chromosome studies has not in the past proved suitable for permanent preparations. The basic principle of the procedure here offered is that cellulose is used as a mounting medium; it is soluble in acetic acid and can be added easily to any ordinary acetic smear preparation. The working schedule for applying this method to studies of the reduction division in pollen mother cells is presented. Though the author has not yet obtained 100 percent success with it,

it has in many cases given permanent preparations which have very much the same appearance as when they were new.

The leaf organization of Hedera helix, R. B. WYLIE (*Iowa Acad. Sci. Proc., 50 (1943), pp. 199-207, illus.* 11).—This study of English ivy concerns the general foliar organization in comparison with mesomorphic leaves.

The major veins of mesomorphic leaves, E. L. PLYMALE and R. B. WYLIE (*Amer. Jour. Bot., 31 (1944), No. 2, pp. 99-106, illus. 9*).—The leaves used in this study were from native or well-established plants growing in eastern Iowa; all were mesomorphic and included both woody and herbaceous species. The major veins of over 20 species were surveyed with respect to their size, tissue distribution, vein length, and conductive capacity, emphasizing the essential contrasts between the major and minor venation in leaves of this type. Though the major veins contributed only 5 per cent of the total length, they provided the chief support of the leaf blade. In leaves of the woody plants surveyed all major veins showed secondary growth and had both vessels and sieve tubes; the minor veins had tracheids and phloem parenchyma and were closely invested by the specialized border parenchyma. Both major and minor veins were capable of carrying conductive overload. A single secondary vein, with all other veins transected, could supply water for an entire blade with little or no death of tissue. Supplementary experimental lesions compounded the conductive problems and further tested the tolerance of various species to restricted vascular supply. When sun leaves were wounded near midday any death of blades was clearly indicated within 2 hr.; there was no subsequent shift in the line of demarkation, though the leaves were in some cases left on the trees for many weeks. Veins of all categories displaced specialized mesophyll from about 25 percent of the blade, suggesting that figures for the functional capacity of foliage leaves, when based on leaf area, are definitely understatements of mesophyll activity.

GENETICS

Methods of plant breeding, H. K. HAYES and F. R. IMMER (*New York and London: McGraw-Hill Book Co., 1942, pp. 432+, illus. 37*).—The subject matter of this textbook, which has been used in both undergraduate and graduate courses, considers the role and genetic and cytogenetic basis of plant breeding; mode of reproduction in relation to breeding methods; technics in selfing and crossing; the pure-line method of breeding naturally self-pollinated plants; hybridization as a method of improving self-pollinated plants; the backcross method; breeding for disease and insect resistance; inheritance in wheat, oats, barley, and flax; methods of selection for special characters; development of methods of corn breeding; inheritance in corn; controlled pollination methods of breeding cross-pollinated plants; seed production; some commonly used measures of type and variability; field-plat technic; randomized blocks, Latin squares, and χ^2 tests; correlation and regression in relation to plant breeding; and multiple experiments, methods of testing a large number of variables, and the analysis of data expressed as percentages. Tabular material is presented in an appendix, and a bibliography, glossary, and index are provided.

Metodos fitotecnicos: Procedimientos cientificos para mejorar las plantas cultivadas [Phytotechnical methods: Scientific procedures for improving cultivated plants], H. K. HAYES and F. R. IMMER, trans, by A. E. MARINO (*Buenos Aires: Acme Agency, 1943, pp. 521+, illus. 37*).—A Spanish edition of the work noted in the preceding entry. The preface to this edition is by S. Horovitz.

Influence of the environment on the expression of hereditary factors in relation to plant breeding, S. H. YARNELL. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 41 (1942), pp. 398-411; also in Science, 96 (1942), No. 2501, pp. 505-508.*—Instances of marked variation in both plant and animals, due to environmental conditions, are cited. It is pointed out that genes useful to the plant breeder in one environment may be lost when plants grow for a considerable period under other conditions; that the cumulative effect of modifying factors in a certain environment can be used to improve the plant through selection in that environment; that the value of any heritable character under a particular set of conditions bears no relation to its development or lack of development under other conditions; that intervamental crosses in a new environment, with selection, may give a combination of genes of value in the new location; and that wild species can sometimes be used as a source of genes for characters of value under conditions new to them.

The significance of differences in the distribution of diploids and polyploids, A. and D. LOVE (*Hereditas, 29 (1943), No. 1-2, pp. 145-163.*)—A close statistical investigation of the frequencies of polyploids in Timbuktu, Sicily, Schleswig-Holstein, Denmark, Sweden, Norway, Finland, Faeroe Islands, Iceland, and Spitzbergen was made on the basis of χ^2 analysis as noted by Fisher (E. S. R., 76, p. 575). Studies of the frequencies within the whole floras indicate that the higher the latitude the greater is the increase in polyploidy, the general tendency of the increase always being the same from south to north. Calculations showed that polyploidy is more frequent in the monocotyledons than in the dicotyledons. Both groups exhibit the same general tendency, but the former show a decidedly larger rate of increase at the higher latitudes. Likewise there is the same general tendency when only the same families in the six Nordic countries and Spitzbergen are considered. The percentages of polyploid monocotyledons are somewhat lower than in the whole monocotyledon floras, but in the dicotyledons the percentages are somewhat higher. A statistical study of the numbers from the alpine regions of Pamir, Altai, and the Caucasus shows very significant differences among these regions in favor of the theory of the greater hardiness of polyploids over diploids. The halophyte flora of Schleswig-Holstein does not have a significantly higher percentage of polyploids than the region as a whole. The halophytes of Rumania, however, show a distinctly lower frequency of polyploids than the same flora of Schleswig-Holstein. This is assumed to be due to the latitude as well as to the fact that the Rumanian coasts were never reached by the ice age.

The results of the calculations are briefly discussed. The statistical analysis of the material gave good support to the theory of a greater hardiness or adaptability of polyploids than of diploids in the more severe climates. The preponderance of species in tropical and moderate climates and the low number in cold regions are shown to be followed by an increase in the frequenccy of polyploids from temperate to cold regions. It is suggested that this situation results not only from the relatively greater hardiness and adaptability of polyploids to extreme climates but also to the possible relatively higher frequency of long-day or neutral reactivity to the photoperiod in the polyploids than in the diploids. The unexpectedly high values obtained for the Faeroes and Iceland may, it is suggested, be caused by a larger frequency of "overwintering" species and a lower percentage of plant migration since the last Glacial period than are found, e. g., in Scandinavia. The possibility that all the introduced species have been brought in by man during the last 1,000 yr. is pointed out. The desirability of detailed phytogeographical and sociological studies combined with analyses of the frequency of polyploids is stressed. There are 30 references.

Characteristics of two haploid twins in Dactylis glomerata, A. MÜNTZING (*Hereditas, 29 (1943), No. 1-2, pp. 134-140, illus. 3*).—Brief discussion is given to the characteristics of two haploids produced with considerable difficulty, being the only aberrants among 198 twin plants examined in *D. glomerata.* In both cases the other member of the pair was a normal *glomerata* plant, with $2n = 28$; both haploids were controlled to have $2n = 14$ in the root tips. Morphological details are presented as of much interest with regard to the nature of the species differences between *D. glomerata* and *D. aschersoniana.* Further study of such haploid plants may to a certain degree elucidate the causes of inbreeding degeneration in *D. glomerata,* as well as the genotypical relationship between this species and *D. aschersoniana.*

Cytological studies of a triploid perennial ryegrass and its progeny, W. M. MYERS. (U. S. D. A. et al.). (*Jour. Hered., 35 (1944), No. 1, pp. 17-23, illus. 2*).—At mid-prophase of an autotriploid perennial ryegrass plant there was an excess of paired and a deficiency of unpaired chromosome regions as compared with the expected; this was interpreted as resulting from nonhomologous association. At metaphase I, univalents occurred in 58.5 percent of the sporocytes, the maximum number per sporocyte being four. The metaphase I univalents tended to lag and divide equationally at anaphase I. There were more lagging univalents at anaphase I than unpaired chromosomes at metaphase I, the excess of anaphase I laggards probably resulting from improper disjunction of trivalents. Micronuclei in the quartets resulted from failure of the daughter univalents from anaphase I laggards to be included in a daughter nucleus either in the first or second division. There was evidence that some of the daughter univalents were included in the microspore nuclei and that some micronuclei were formed also as a result of abnormalities of the second division. Among the functional eggs, as measured by chromosome numbers of the seed progeny of the triploid, there was an excess of haploid and a deficiency of aneuploid, particularly those with three or more extra chromosomes, as compared with the frequencies expected from anaphase I distributions in the microsporocytes. In $2x + 2$ plants, the distribution of the two extra chromosomes at anaphase I was at random.

Genetical effects of duplicated fragment chromosomes in rye, A. MÜNTZING (*Hereditas, 29 (1943), No. 1-2, pp. 91-112*).—In the offspring of a rye plant with two extra fragment chromosomes a material was raised with the number of fragments ranging from 0 to 8; the genetic effects of such chromosomes were studied over a 2-yr. period in 308 plants. Taking the results as a whole, a slight but significant effect could be demonstrated for straw weight, plant height, and number of culms. In all cases, however, the effect was obvious only when a large number of fragments were present. Fertility was influenced more by the fragment chromosomes than was vegetative development. There was a marked significant, though nonlinear, negative correlation between number of fragments and kernel weight per plant, number of kernels per ear, percentage of seed setting, and pollen fertility. The measurements demonstrated that the duplicated fragment chromosomes are not inert, as had been supposed by some workers. However, considering the size of the fragments and the effects of whole extra chromosomes, it is believed probable that the fragments are subinert, having a lower proportion of active genes than the ordinary chromosomes. The origin of rye plants with duplicated fragment chromosomes is discussed, and it is concluded that the 16-chromosome strains in rye populations are short-lived but that they are frequently produced anew from plants with 14 chromosomes. This is possible on account of the rather frequent occurrence of fragmentation and other structural and numerical chromosome modifications in rye. There are 27 references.

Aneuploidy and seed shrivelling in tetraploid rye, A. Müntzing (*Hereditas, 29 (1943), No. 1-2, pp. 65-75*).—In this report the author briefly considers the apparent production of parthogenetic diploids and the correlation between aneuploidy and seed shriveling in tetraploid rye varieties produced by the heat shock and colchicine methods. Details regarding morphology, fertility, and chromosome variation are included.

Selection and genetic responses in a segregating maize population, W. B. Kemp and R. G. Rothgeb (*Maryland Sta. Bul. A26 (1943), pp. 33+, illus. 1*).—Progeny of a cross between Reid Yellow Dent and Stowell Evergreen (white) sweet corn was grown isolated through F_7, 1932-37. Self-fertilization varied from 0 to approximately 10 percent, with an average of 3.7 per cent.

Homozygous sugary kernels had a reproductive capacity about 75 percent as great as homozygous starchy ones. Sugary kernels molded more freely and a smaller proportion produced plants, and also a smaller proportion of mature plants from sugary kernels bore grain and bearing plants produced less grain. Through seven generations of natural selection, number of ears per plant tended to increase, while number of tillers decreased along with proportions of plants having husk blades and with sugary kernels, white kernels, and white cobs. Apparently, except number of ears per plant, any measurable characteristic entering the cross from the sugary parent tended to disappear under the influence of natural selection.

Associations between number of tillers, long shanks, and long husk blades were highly significant, and the positive correlation between numbers of ears and numbers of tillers was significant in every year. Plants from large kernels outyielded those from small kernels, and sugary kernels produced plants with more ears than those from starchy kernels, a superiority tending to increase in late generations. The heterozygote was intermediate in ear number. Prolificacy was accompanied by increased yield and reduced row number per ear, although with a fixed ear number large kernels accompanied low row number. Within limits, kernel size appeared inversely proportional to kernel numbers and might be directly proportional to carbohydrates not utilized in the plant. White kernels produced plants with more ears than those produced by yellow ones, this superiority diminishing until after F_4 when plants from yellow kernels produced more ears. Here too, the heterozygous class was intermediate in ear number.

In a sample including more than 1,000 of the seeds planted to produce the F_7 generation, those segregating for yellow endosperm and for sugary endosperm were slightly heavier than those of either alternative homozygous class. Also, double heterozygotes were slightly heavier than either class of single heterozygotes. Plants from kernels heterozygous for sugar usually averaged taller than either homozygous class, from kernels heterozygous for endosperm color than either homozygous class, double heterozygotes than either single heterozygous class, and plants from sugary kernels always taller than those from starchy kernels. Plants from kernels heterozygous for sugary usually averaged more tillers than either homozygous class, double heterozygotes usually more than either single heterozygous class, and from starchy kernels more than from sugary kernels. In number of kernels per plant, homozygous starchy class was superior in F_2 and F_3, thereafter the heterozygote was superior; and the heterozygote for endosperm color was superior through F_2, F_3, and F_4, thereafter the yellow endosperm type was superior. In weight of kernels per plant, the homozygous starchy class was superior to the heterozygote in F_2 and F_3 thereafter the heterozygote was superior; and the heterozygote for endosperm color was superior through F_2 and F_3, and the yellow endosperm type thereafter. These observations with respect to ear number, kernel

number, and grain weight are held consistent with the hypothesis that excess vigor in generations beyond F_1 for kernel number and weight of grain trace to the same cause in both endosperm type and endosperm color despite their opposite trends.

Effect of corn barriers on natural crossing in cotton, O. A. Pope, D. M. Simpson, and E. N. Duncan. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*] *68 (1944), No. 9, pp. 347-361, illus. 4*).—Corn barriers were found effective in reducing the amount of natural crossing between green- and red-leaf cotton, and the reduction tended toward linearity for the different barrier widths used in this 2-yr. experiment, i. e., adjacent and separated by three, six, and nine rows of corn. The barrier widths of corn used, however, did not afford enough protection for multiplication of selfed-line seed stocks. The minimum amount of natural crossing found would in a few generations of multiplication so reduce homozygosity to a point where the seed stocks would be mixed too badly for continued production. Small-block plantings of red-leaf cotton, made at distances ranging from 700 to 4,200 ft. from green-leaf cotton, established occurrence of natural crossing at distances up to 0.8 mile. Distances of 1 mile or more, therefore, would be required to provide complete isolation. Comments are also made on production of hybrid seed for commercial planting and on collection of insects in the field concerned more or less in transfer of pollen.

Leaf segregation in Citrus-Poncirus hybrids, S. H. Yarnell. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 259-263, illus. 9*).—Fifteen varieties of citranges were classified on a basis of segregation observed in their open-pollinated seedlings. Eleven varieties had less than 1 percent of segregating seedlings, 1 variety had 5.7 percent, and 3 had over 95 percent. Comparable figures for 17 citrumelo varieties are 5 varieties with less than 1 percent segregation, 6 with about 10 percent, and 6 with an average of 72 percent. The segregating seedlings were classified as to the following types: Unifoliate, semiunifoliate, deciduous, small or weak, other. These are illustrated by line drawings. The maternals were like the seed parent and indistinguishable among themselves. The amount of segregation observed is more than has been previously reported. Such material should prove useful as a basis of further breeding.

Evidence for natural hybridity between guayule (Parthenium argentatum) and mariola (Parthenium incanum), R. C. Rollins. (U. S. D. A.). (*Amer. Jour. Bot., 31 (1944), No. 2, pp. 93-99, illus. 10*).—From a greenhouse population of about 205,000 guayule plants from seeds collected in the wild, 162 hybrids from immediate crosses in nature between guayule and mariola were identified; thus less than 0.1 percent were hybrids. Hybrid plants were found in cultures of the usual type guayule, the microtrichome type, and the "intermediate" type. A single hybrid was discovered among nearly 1,000 plants of mariola. Seeds yielding hybrid plants came from widely separated locations in Mexico and Texas. Seeds of a wild plant from Texas, identified in the field as mariola but with certain characteristics of guayule, gave a progeny of 25 hybridlike plants and 3 appearing very similar to mariola. Evidence from the morphology of the trichomes is presented as the primary basis for determining the hybrids; in general they are intermediate in morphology between guayule and mariola but considerable variation occurs among hybrid plants. Certain types of guayule grown from seeds collected in Mexico and Texas had traits suggesting that crosses with mariola had played a part in their phylogenetic development. Some plants from similar sources appeared to have resulted from backcrosses between recent interspecific hybrids and guayule.

Guayule plants with low chromosome numbers, A. D. Bergner. (U. S. D. A.). (*Science, 99 (1944), No. 2568, pp. 224-225*).—Many plants from seeds collected in Durango, Mexico, have thinner leaves than those of the 72-chromosome

types but in general may be characterized as vigorous growers, early, and prolific seed producers. Eleven of these plants examined cytologically had 36-39 chromosomes; they are considered to be diploids since at diakinesis they all had 18 pairs of chromosomes. Two dwarf plants from seeds collected in Texas were also studied; one had 38 and the other 36-38 chromosomes. It is concluded that although these two dwarfs also belong to the 36-chromosome class, they are to be considered as haploids of the 72-chromosome population in which they occurred. The contrast in morphological appearance and chromosome behavior in these two sets of plants emphasizes the fact that more than mere chromosome number is needed for an understanding of the appearance and breeding behavior of guayule plants.

The genetic basis for constructing selection indexes, L. N. HAZEL. (Iowa Expt. Sta. coop. U. S. D. A.). (*Genetics, 28 (1943), No. 6, pp. 476-490, illus. 1*).—A statistical analysis of swine data led to the conclusion that "the genetic gain which can be made by selecting for several traits simultaneously within a group of animals is the product of (1) the selection differential, (2) the multiple correlation between aggregate breeding value and the selection index, and (3) genetic variability. The first of these may be very small due to the breeder's carelessness, procrastination, etc., and is limited by the rate of reproduction for each species, while the third is relatively beyond man's control; hence the greatest opportunity of increasing the progress from selection is by insuring that the second is as large as possible." To construct selection indexes for young boars and gilts one must know the relative economic value of different traits; the standard deviation for each trait and the correlation between each pair of traits; and the heritability of each trait and genetic correlations between each pair of traits. Examples of the use of selection indexes for young boars and gilts are taken from the Iowa Station swine herd (E. S. R., 88, p. 182). These indexes were established correlating 180-day weights and individual scores, with the productivity and scores of the dam, and with the traits and average weights and scores of the litter of which each pig is a member. Confusing effects of environmental circumstances, dominance, and epistasis make phenotypes unlike genotypes. Possible progress was from 36 to 40 percent of that which could be made with a perfect index.

Androgenesis in the parasitic wasp Habrobracon, P. W. WHITING (*Jour. Hered., 34 (1943), No. 12, pp. 355-366, illus. 9*).—Sex in *H. juglandis* Ashm. is determined by a single series of allelic factors; any haploid or homozygous diploid is male and any heterozygous combination is female. The multiple effects of the six-linked gene *fused,* and the differential action of modifying factors on these primary fused effects, are discussed. Haploid mosaic males and diploid impaternate females developing from unfertilized eggs occur irregularly. From fertilized eggs, the most frequent of the irregular types are gynanders with diploid biparental female parts and haploid male parts developing gynogenetically from a second egg nucleus. Hitherto, gynanders with haploid male parts developed androgenetically from a second sperm nucleus have been extremely rare, although dispermy may occur in about 1 percent of fertilized eggs. An independent sperm nucleus cannot then, in general, undergo cleavage as readily as an independent egg nucleus. The author here reports and describes 18 irregular types produced from crosses of a stock recently obtained. It is suggested that there are in this stock some genetic differences which affect the sperm nucleus, making it resemble the egg nucleus in being capable of entering upon cleavage without syngamy.

Reduced phalanges and curly coat: Two mutant characters in native Swedish cattle, I. JOHANSSON (*Hereditas, 28 (1942), No. 3-4, pp. 278-288, illus. 5*).—

Two mutant characters which have occurred in Swedish cattle are described. In one, due to a recessive gene, the metacarpal and metatarsal bones are shorter than normal and phalanges I and II are entirely missing, but phalanx III and the hoof are normal. Animals expressing the condition cannot stand, but crawl on knees and hocks. In the other mutant, due to a dominant gene, the hair of the newborn calf is curly.

Potential fertility of ova from ewes treated with gonadotropins, R. L. MURPHREE, E. J. WARWICK, L. E. CASIDA, and W. H. MCSHAN. (Univ. Wis.). (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 12-21*).—A total of 576 corpora lutea was produced in 24 ewes treated 12 days after the beginning of oestrus with 4 subcutaneous injections of 11 different follicle-stimulating extracts prepared by methods previously described (E. S. R., 86, p. 436) and an intravenous injection of luteinizing extract on the sixth day thereafter. The ewes were then artificially inseminated. Examinations of the ova were made 2–5 days after the intravenous injection. These showed the presence of 2–19 fertilized ova in 17 ewes. There were no fertilized ova in 7 of these animals. No fertilized ova were found in 5 "luteal" ewes treated with the follicle-stimulating extracts, although there were 57 corpora lutea and 25 ova found. In 9 "anoestrous" ewes treated with follicle-stimulating extracts there were found 84 corpora lutea and 25 unfertilized ova. Only 1 of 8 ova found in another group of anoestrous ewes treated with pregnant mare serum or with pregnant mare serum and unfractionated pituitary extract was fertilized. Significant but unexplained differences were noted in the viability of different ewes and their responses to certain of the follicle-stimulating extracts.

Maintenance of the pregnancy induced in the female rabbit following treatment with pituitary gonadotropins, E. J. WARWICK, R. L. MURPHREE, L. E. CASIDA, and R. K. MEYER. (Univ. Wis.). (*Anat. Rec., 87 (1943), No. 3, pp. 279-296*).—In further study of the fate of artificially ovulated ova, noted above, multiple ovulations observed in juvenile and adult rabbit does induced by gonadotropic extracts of sheep pituitary powder showed heavy embryonic mortality. Only 1 of a group of 9 juvenile artificially inseminated females was pregnant at 10 days. Between 2 and 3 days after insemination there were averages of 20.6 normal embryos, but only 10.7 embryos were present in a group of 7 does examined from 5 to 9 days after insemination. There was an average of 31 normal embryos in 26 adult females examined 2 to 3 days after insemination, but it had declined to 5 after 9 days, and 2.9 embryos were present from 12 to 13 days after insemination. Detailed examination of the embryos indicated that embryonic retardation was a gradual process, beginning as early as the fifth day. Embryonic life was prolonged by progesterone and oestradiol treatments, as 16 of 35 juvenile rabbits and 4 of 5 adult females were pregnant from 10 to 15 days after insemination. The performance of 12 treated juvenile females allowed to go to term was little if any better than that of juvenile females with no supplementary treatment.

In transplantation of 106 fertilized ova from treated females and 42 ova from normal females to the uteri of normal females, only 10 and 7.1 percent, respectively, survived to term. Embryonic death seemed due to a primary or secondary uterine deficiency rather than to defects induced in the ova resulting from the rapid maturation.

Vascular changes in the rabbit uterus and in intraocular endometrial transplants during pregnancy, B. KRICHESKY. (Univ. Calif.). (*Anat. Rec., 87 (1943), No. 3, pp. 221-234*).—Study of the hyperemia and the mucosa of rabbits, which begins early in pregnancy (E. S. R., 90, p. 174), showed that there was a marked reduction in the area of the vascular bed from the twenty-third to the

twenty-eighth day, but that it increased until parturition after which there was a decrease.

Relationship of specific gravity and shell appearance to the hatchability of fertile turkey eggs, R. E. Phillips and C. S. Williams. (Md. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 2, pp. 110-113*).—The specific gravity of 1,559 turkey eggs did not serve as an indication of hatachability, although Mussehl and Halbersleben (E. S. R., 49, p. 373) found a small significant correlation between specific gravity of chicken eggs and hatchability. The specific gravity of the turkey eggs showed individual characteristics. Thickness of shell and specific gravity were related, but no relationship was found between hatchability and dark spots or faintly spotted eggs or between smooth-shelled eggs and those which had large calcareous deposits.

Distribution of dry constituents of yolk and albumen in the developing avian egg, A. L. Romanoff. ([N. Y.] Cornell Expt. Sta.). (*Anat. Rec., 87 (1943), No. 3, pp. 303-306, illus. 1*).—Changes in the dry matter of dense and liquefied yolks and albumen during incubation of chicken, pheasant, and quail eggs were essentially the same. The percentage of dry matter in the dense yolk decreased from about 54 percent to about 45 percent within the first 10 percent of the incubation period and remained at that point until the latter part of incubation, when it rose slowly to about 57 percent. The dry matter of liquefied yolk and albumen is low at first but rises sharply.

Cultivation of the early chick embryo in vitro, A. L. Romanoff. ([N. Y.] Cornell Expt. Sta.). (*Anat. Rec., 87 (1943), No. 4, pp. 365-369, illus. 4*).—For numerous studies of the influence of radiation (E. S. R., 89, p. 433), drugs, and various chemicals, uninterrupted development of the chick embryo was effected up to the 48-hr. stage in vitro by holding the temperature at 37.5° C. and the surrounding relative humidity at 60 percent. After rupture of the albuminous sac, the yolk was submerged by means of a glass ring into the albumin and the container was covered with a suitable beaker to prevent excessive evaporation. The method and apparatus are illustrated.

Inheritance in the domestic fowl of a lethal condition affecting both mandibles, D. R. Marble, J. A. Harper, and E. V. Hammers. (Pa. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 2, pp. 114-117, illus. 2*).—A lethal condition in chick embryos, in which the lower mandible was almost entirely missing and the upper mandible was much reduced in size, preventing pipping of the shell, was discovered in unpipped eggs. In 512 progeny of 3 families there occurred 134 lethals. The condition was apparently recessive and autosomal. Heterozygous embryos, chicks, and adults were normal.

Response of sexually inactive chicken males to pregnant mare's serum, R. N. Shoffner and P. C. Smyth. (Minn. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 2, pp. 154-155*).—Semen with motile spermatozoa was secured on the sixth, seventh, and fourteenth days from three timid White Rock males at 7.5 mo. of age following injection with 200 units of Gonadin in two doses over a 3-day period. The combs and wattles enlarged, feather development increased, and fertility continued. All but one of six Single-Comb White Leghorn males came into semen production within 14 days following four injections at 3-day intervals with 150 units of pregnant mare serum per injection. In another sexually immature Barred Plymouth Rock male, semen production was induced by five injections of 150 units of pregnant mare serum continued every 2 days.

The behaviour of abnormal feather pigmentation in the Brown Leghorn to-

ward estrogens, M. JUHN. (Univ. Md.) (*Anat. Rec., 87 (1943), No. 4, pp. 452-453*).—Abnormally pigmented Brown Leghorns showed different responses to pigmentation resulting from treatment with stilboestrol, theelin, and theelin and thyroxine in combination, depending on the phase of pigmentation of the feather or feather segment. In black-feathered Brown Leghorn males theelin and stilboestrol caused typical salmon hen feathering. These hormones caused the reappearance of black in feathers laying down red in marginal segments. There was a return to red on cessation of treatment. Theelin was ineffective in completely red feathers save in increasing barbulation. Thyroxine and theelin together caused a grayish color in feathers originally red and salmon in those which were black.

FIELD CROPS

Biases encountered in large-scale yield tests, O. C. RIDDLE, and G. A. BAKER. (Coop. U. S. D. A.). (*Hilgardia [California Sta.], 16 (1944), No. 1, pp. 14*).—Tests in 1939 of the comparative yielding abilities of random selections from genetically similar strains of Baart 38 and White Federation 38 wheats involving the modified Latin square revealed significant differences between strains. In 1940 significant differences were again indicated, but with reversals from the previous year. When the 1939 and 1940 results were combined and strains significantly greater and less than the general mean were tested again, these strains were found, in a small-scale Latin square experiment, to be not significantly different. The data were examined critically from the viewpoint of validity of assumptions underlying statistics used. If the residuals in these experiments are examined, the block mean residual proves significantly and positively correlated with the block mean yield. Some of the difference in plant fertility levels evidently has been assigned to strain differences, the result being a spreading effect on strain means and a tendency to indicate significant differences in this large-scale experiment when, in fact, none exists. Small differences in yielding ability may actually exist between strains tested but are marked by the spotted variation in soil fertility levels, and are not of the order of magnitude nor of the degree of significance indicated by ordinary analysis of variance.

Varieties of farm crops for Montana, 1944 (*Montana Sta. Cir. 177 (1944), pp. 32, illus. 1*).—A revision of Circular 171 (E. S. R., 89, p. 439).

Southern field crops management, E. N. FERGUS, C. HAMMONDS, and H. ROGERS (*Chicago: J. B. Lippincott Co., 1944, pp. 725+, illus. about 200*).—This book is designed for use by those engaged in producing field crops in the South. The successive chapters deal with what crops to grow, corn, the tobacco crop, small grains, hay crops, pasture as a crop, principles of plant growth, selecting and producing seed of farm crops, soil in relation to crops, tillage, cotton, and miscellaneous southern crops. Large use is made of data from experiment station and U. S. Department of Agriculture sources.

Soil fertility studies in the Piedmont.—II, The effect of crop rotations in crop production, C. B. WILLIAMS, W. H. RANKIN, and J. W. HENDRICKS (*North Carolina Sta. Bul. 341 (1943), pp. 20, illus. 8*).—The series (E. S. R., 87, p. 344) is continued.

Rotations at the Piedmont Substation, 1918-39, either without or with legumes, were much more effective with fertilization of major crops than without. Corn yields could be more than doubled by use of rotations, and within reasonable limits were higher as the rotations were longer and there were more legumes in the rotation. Continuous corn resulted in poor yields and the physical condition of the soil

declined because of a lack of organic matter. Wheat yields were not affected as much as corn yields by continuous culture, although yields of fertilized wheat in a 2-yr. rotation including crops of cowpeas were increased about one-third whether limed or not. In a 3-yr. rotation including legumes, wheat yields were greater by more than two-thirds without lime and almost doubled with lime.

Although a 2-yr. rotation of corn and wheat, with a cowpea catch crop after each crop, increased yields, they were not maintained with cowpeas alone. Cowpeas were from two to three times more effective with corn and more than one-third more effective with wheat on fertilized soil. Use of a 4-9-2 fertilizer in a 2-yr. rotation, with or without cowpeas, increased yields over the check. Fertilizers were more effective with both corn and wheat when used with legumes. Manure was the only treatment in the 2-yr. rotation that increased corn yields in the second 8 yr. over the first 8 yr.

A 3-yr. rotation of corn (cowpeas)-wheat-red clover produced larger corn yields than a 2-yr. rotation and maintained them at about the same level over 28 yr. Wheat yields were much larger in the 3-yr. rotation and increased somewhat in time. Highest corn yields were obtained with an application of P and K equal to the quantities removed by maximum crops. This rotation, without addition of mineral nutrients, evidently will not maintain corn yields over a period. Good wheat yields may be obtained in a 3-yr. rotation when enough available P is added to the wheat crop. The yields increased from the first to the last periods. Red clover yields in a 3-yr. rotation seems to depend upon adequate lime, P, and K. Liming increased clover hay yields from two to three times under all fertility treatments, P doubled the yields over the no-P plat, and addition of K to P caused another doubling of the yields.

Limestone was not profitable on land in continuous corn or wheat or in a 2-yr. rotation of corn and wheat. In 2-yr. rotations, without and with cowpeas, and in the 3-yr. rotation with legumes, with all major crops fertilized, regular liming was not profitable with corn but it was with both red clover and wheat in the 3-yr. rotation.

Dry-farming investigations in northeastern New Mexico, 1936-1943, J. Carter, Jr. (*New Mexico Sta. Bul. 312 (1944), pp. 20, illus. 5*).—Field crops experiments, 1936-43, near Clayton (4,900 ft. altitude), Capulin (6,680 ft.), and Mosquero (5,550 ft.) supplemented those reported on earlier (E. S. R., 65, p. 527; 76, p. 27; 82, p. 176). The period included 6 yr. in which moisture conditions were unfavorable and 2 yr. very favorable. Soil blowing during early spring, a serious factor in this part of the State, may be controlled by correct tillage practices and strip cropping. Outstanding varieties included Union County White and Hays Golden corn at Clayton, Colorado No. 13 at Mosquero, and White Flint at Capulin; Sedan kafir, Dwarf Yellow milo, Quadroon, and Leoti Red sorgo; Cheyenne winter wheat at Mosquero and Capulin; Conway and Odessa spring barleys at Capulin; Pinto bean at Clayton and Capulin and Bayo at Mosquero; and Pinto bean strains Nos. 295 and 247 at Clayton and Capulin. Siberian and proso millets have averaged more hay per acre than Sudan grass, but the quality of the latter usually has been more desirable.

Subclimax prairie, A. L. McComb and W. E. Loomis. (Iowa Expt. Sta.). (*Bul. Torrey Bot. Club, 71 (1944), No. 1, pp. 46-76, illus. 25*).—Undisturbed Iowa forests are reported to have survived the recent drought years without injury and to be spreading and maintaining themselves under present climatic conditions. Oak-hickory forest is therefore considered to be climax, from somewhere around the Missouri and Little Sioux Rivers eastward. In western Iowa, with a climate approaching that of a prairie climax, soil factors become increasingly important, and

forest potentialities are limited to the coarser textured, better-aerated soils. Forest in this area requires no protection, however, from the full force of sun and wind and is currently invading both disturbed and undisturbed areas. General and local evidence indicates that the climate of Iowa has changed from boreal through oak-hickory forest to grassland climate, and that the current forest climate has probably existed for only 700-800 yr. The prevalence of prairie in Iowa and Illinois probably dates to the soils disturbances initiated by the first or Nebraskan glaciation. The prairie peninsula is considered to be a subclimax associes maintained by the soils and topography of the glacial till plains.

On the unleached soils from deep sheets of Peorian loess and Wisconsin till, the high lime content and past xerothermic periods have favored prairie grasses and legumes which have built up high nitrogen and organic contents which now stimulate the growth of grasses at the expense of invading forest-tree seedlings. On the leached but undissected till plains of the Kansas and Illinoian glaciations, planosols of poor surface and internal drainage and aeration have been developed which are distinctly unfavorable to trees. Planosol prairies are invaded very slowly by the more xeric forest species, and their transformation to oak-hickory climax will probably require extensive erosion to establish drainage and permit development of new and less mature soil profiles. These prairies may therefore be considered to be semipermanent edaphic but not climatic climax. Forest invasion along streams is considered to be related in the older soils to increased drainage and soil aeration, and in the less mature to the removal of the high-N surface soils which are relatively much more favorable to the growth of grass than of the slow-growing and vulnerable tree seedlings.

These relationships shown for Iowa are said to be present throughout North America and in Europe, Africa, and Australia. In local areas prairies are maintained by sandy or gravelly soils too dry to support forest. The great bulk of the peninsula and of other subclimax prairie, however, is found on silty or clayey plains of glacial, alluvial, or other origin. Poor soil aeration caused by fine-textured soil and poor drainage is believed to be the most important factor in the persistence of these subclimax prairies. There are 45 references.

Comparison of dominant prairie grasses as interplanting ground covers on eroded soil, J. M. Aikman and R. E. McDermott. (Iowa Expt. Sta. and U. S. D. A.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 235-240, illus. 1*).—In the two experiments here described, attention was first given to establishment of the interplanting vegetative cover on the almost bare soil before setting out such economically valuable woody plants as grapes, plums, nut trees, post trees, or sumac for tanning material on benchlike plowed contour strips between the interplating strips. The grasses used in these tests were three species of upland or true praire type (*Andropogon scoparius, Stipa spartea,* and *Bouteloua curtipendula*) and three species of lowland subclimax prairies grasses (*A. furcatus, Sorghastrum nutans,* and *Panicum virgatum*). The four species *A. scoparius, A. furcatus, S. nutans,* and *P. virgatum* proved very nearly equal in average yields over three seasons (1940-42) on the two sites used, one of which was comparable in soil moisture conditions to lowland and the other to upland prairie. The yield data would seem to indicate that the three lowland-prairie dominants are suitable for planting on sites with abundant soil moisture but do not give good results in pure seedings on dry areas. Nevertheless, prairie grass mixtures containing these species as planted on the two experimental sites gave excellent results in yields as well as in basal area. *A. scoparius* was a very important constitutent of such mixtures on both sites; *Stipa spartea* is not suited to planting alone on either type of site but does have a place in

mixtures of true prairie grasses for upland planting. *Sorghastrum nutans* proved a valuable ground cover on both sites, and *A. scoparius* ranked approximately as high in basal area on the dry site. These two species should probably be more generally used than any others in planting mixtures of prairie grasses made to order for specific critical sites.

Pasture fertilization, C. F. Noll, S. I. Bechdel, P. S. Williams, S. R. Skaggs, and M. A. Hein. (Coop. U. S. D. A.). (*Pennsylvania Sta. Bul. 460 (1944), pp. 27+, illus. 9*).—Pasture experiments, 1930-39, are reported in two parts. Results 1930-34 have been noted earlier (E. S. R., 74, p. 627).

I. *Fertilized pastures* (pp. 2-20).—Pasture plats (2-acre) on Rayne silt loam (formerly termed Dekalb) near Kylertown sown with a mixture of Kentucky and Canadian bluegrasses, redtop, timothy, and white, alsike, and red clovers and variously treated with N, P, K, and lime were grazed and quadrats were cut for hay and clipped to about 1 in. high. N applications (24, 48, and 72 lb. per acre) increased pasture yields markedly in May, with 72 lb. giving the most early growth, but that was the only rate consistently more productive after June than pastures receiving minerals only. Greater production did not result from dividing 24- and 48-lb. N rates into April and July applications. P in superphosphate gave larger increases in production than N or K, and resulting herbage was higher in P than that from untreated pastures. K gave consistent increases in pasture yield. P alone and with K gave substantial profits, but N added to minerals did not increase net returns except with highest N applications.

Timothy and redtop predominated at first but later were replaced largely by the bluegrasses. Clovers decreased slightly and were lowest both at the beginning and end end of experiment on plats receiving most N. The hay yields were much larger, but clippings were higher in percentages and acre yields of protein. A high correlation was shown between total digestible units from grazing and from clipping, but computed total digestible units from grazing averaged 78 percent as much as from clippings on enclosed quadrats and 80.5 percent as much as from caged clippings on pastures.

II. *Fertilized plots on which grass was cut* (pp. 21-26).—On 1/80-acre plats half of each plat was cut for hay and aftermath and half clipped at about monthly intervals. N alone 16 lb. per acre yielded as high as 32 lb. in hay but lower in clippings. Sodium nitrate did not seem so good for hay yields as ammonium sulfate or cyanamide. Where N was applied on plats receiving superphosphate biennially, the heavier applications gave the higher yields, and sodium nitrate was the superior source. Single annual applications of 16, 24, and 32 lb. of sodium nitrate per acre on plats receiving P and K biennially gave slightly higher yields than divided applications, and yields rose slightly with the N rate. Ammonium sulfate and cottonseed meal returned lower yields than other N carriers, 1935-39. Yields increased slightly with each increase in acre rate of superphosphate and rock phosphate, and 32 lb. (P_2O_5) annually gave slightly higher yields than 64 lb. biennially. Rock phosphate returned decidedly lower yields than superphosphate. Effects of different rates of these materials and KCl in complete fertilizers are also reported.

Commercial nitrogen benefits pastures and meadows, D. S. Fink. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 6, 11*).—Response of annual and permanent pasture and meadow to N fertilizer is discussed, with brief reports on station experiments. White clover-Kentucky bluegrass association could be made to produce as much dry matter and protein an acre as a pure stand of Kentucky bluegrass treated with about N 130 lb. per acre. Sometimes white clover does not respond fast enough to

mineral fertilization, especially during early stages of pasture improvement, to give increased pasturage needed. Then N fertilizer, in addition to minerals, may give threefold or larger increases in pasturage within a few weeks. In northern New York, N 60 lb. per acre applied to oats and to Sudan grass more than doubled the amount of grazing obtained per acre from these crops. That fertilizer N is not needed for high production of meadows when legumes comprise 50 percent or more of the total vegetation was demonstrated in fertilizer investigations at Churchville, N. Y. Applications of from 100 to 200 lb. per acre of ammonium nitrate, or about N 30-60 lb. are within the range of application with pasture and hay crops for most economical returns.

A new legume-grass partnership, M. E. HEATH and M. C. JAMES. (Coop. Iowa Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv., 9 (1944), No. 10, pp. 232-233, illus. 3*).—Canada wild-rye, *Elymus canadensis,* in combination with sweetclover in short rotations on rolling land in western Iowa was found to form a protective sod, practically eliminate bloat, and guard the land against soil washing between the time the sweetclover matures and corn planting the next spring. In 29 field trials since 1939 Canada wild-rye has consistently produced good stands in contrast with timothy and smooth bromegrass, which often failed. It is resistant to drought and heat, and grasshoppers like it less than smooth bromegrass. Satisfactory stands have been obtained with 20 lb. of Canada wild-rye seed per acre broadcast, the customary amount of sweetclover, and not more than 2 bu. of oats. When sweetclover is in its second year, Canada wild-rye starts growing from 2 to 3 weeks earlier in the spring, but both crops mature early in August. Beef cattle have found that Canada wild-rye, in a mixture with sweetclover, is palatable in its early leafy stages. Herbage of the two species is grazed about equally.

Fertilizers for legumes, R. L. COOK and C. E. MILLAR (*Michigan Sta. Spec. Bul. 328 (1944), pp. 28, illus. 14*).—Alfalfa and clovers use much P and K and need such fertilizers on most soils for maximum yields. Results of cooperative tests in Michigan indicate that on the heavy soils where legumes are seeded with small grain nurse crops from 300 to 400 lb. of 0–14–7 or 0–20–10 fertilizer should be applied at time of seeding. Superphosphate alone may suffice when large quantities of manure have been applied recently. On the better sandy loams where seedings may also be made with a nurse crop, 0–12–12 fertilizer is to be applied at the same rate per acre. On the lighter soils where the legumes are seeded without a nurse crop the analysis recommended is 0–12–12 and for extremely light soils 0–9–27. Good results have been obtained from top dressings of fertilizer on established stands of alfalfa, a practice recommended after the second harvest year. The same analyses as suggested above for seedings on heavy and light soils should be applied at rates of from 200 to 300 lb. per acre.

Legume seed production in the North, E. A. HOLLOWELL (*U. S. Dept. Agr., 1944, AWI-49, rev., pp. 11*).—A revision of the publication noted (E. S. R., 90, p. 39).

Beans, bean straw, and bean pods, H. R. PETTIGROVE (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 233-234*).—Areas harvested from a field of Michelite pea beans were characterized by (1) viny, vigorous, and apparently high-yielding plants; (2) less viny, with fewer pods per plant; and (3) small plants with short runners. The respective yields per acre of the entire plant were 2,960, 1,660, and 1,180 lb.; of beans 1,680, 984, and 732 lbs.; straw 1,280, 676, and 448 lb.; and pods 460, 300, and 224 lb. When bean straw is fed to farm animals the pod represents most of the plant consumed. The pods are higher in protein and N-free extract and lower in ash, ether extract, and crude fiber than is bean straw.

Kansas corn tests, 1943, R. W. JUGENHEIMER, A. L. CLAPP, C. D.

Davis, and C. R. Porter. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 323 (1944), pp. 36, illus. 1*).—Results of extensive corn tests in Kansas (E. S. R., 89, p. 205) are presented in some detail for 1943 and are summarized for 1939-43. The State was divided into seven districts on the basis of soil, rainfall, and growing season. The 1943 program included open-pollinated varieties and hybrids developed and distributed by Federal, State, and commercial agencies. Tests of more than 400 Kansas-developed experimental hybrids, not yet available commercially, have not been reported. Entries in experiment station or corn performance tests that stood up as well as the average of the better-adapted open-pollinated varieties and produced at least 10 percent more corn, and the better strains in the cooperative corn tests, are listed.

Which corn variety or hybrid to grow? W. Wiidakas (*North Dakota Sta. Bimo. Bul., 6 (1944) No. 4, pp. 2-5*).—Yields of grain and fodder are again (E. S. R., 89, p. 307) reported from comparative tests of corn hybrids and varieties at the station and substations within the years 1938-43. Brief comments are made on the merits of the several types.

Results of hybrid corn yield trials in West Virginia for 1943, E. J. Wellhausen, J. L. Cartledge, and R. J. Friant (*West Virginia Sta. Mimeog. Cir. 49 (1944), pp. 11+*).—Yields and moisture contents are shown for corn hybrids (E. S. R., 90, p. 41) included in cooperative trials in 17 counties in 1943.

Hybrid corn, E. J. Wellhausen and J. L. Cartledge (*West Virginia Sta. Cir. WS 1, rev. (1944), pp. [8]*).—A revision of WS 1, Plant Hybrid Corn for Victory, for Profit (E. S. R. 88, p. 473), indicating corn hybrids for counties according to maturity and elevation. Recommended hybrids include Ohio M–15, K–24, and W–17; W. Va. B–15, B–12, B–21, and B–17; Iowa 939; and U. S. 65, 44, 52, and 13.

Ratooned S × P cotton, R. H. Peebles and H. J. Fulton (U. S. Dept. *Agr. Cir. 693 (1944), pp. 11*).—Seed cotton of ratooned S × P cotton (E. S. R., 83, p. 484), collected in 1941 from 33 fields in southern Arizona, differed significantly from comparable samples of the annual crop in the means of all characters measured, and in nearly all characters tended toward greater variability. A definite tendency toward stronger correlation of characters was observed in ratooned cotton. This cotton had smaller, fewer seeded bolls and smaller, less fuzzy, more abundantly linted seeds. The fiber was slightly stronger and finer, but imperfections occurred oftener than in the annual growth. The ratooned crop's outstanding advantage is the higher lint percentage, and its principal disadvantage is the relatively short fiber. Ratooned cotton blooms several weeks earlier than annual plantings, and therefore develops its crop under different conditions as to weather and prevalence of destructive insects. Under favorable conditions ratooned S × P may outyield the annual crop by a wide margin, but poor stands and insufficient or improper irrigation sometimes materially curtail yields.

Effect of varying nutritional treatments on growth and rubber accumulation in guayule, J. Bonner (*Bot. Gaz., 105 (1944), No. 3, pp. 352-364, illus. 9*).—Guayule plants were grown outdoors in gravel culture for 8.5 mo. and supplied with 38 different nutritent solutions of varying anion and cation composition. Two harvests were made, one at the end of the summer growing season and the other at the end of winter—the principal rubber-accumulating season. Growth and rubber accumulation were affected by the N supply more than by that of any other major nutrient element. Plants receiving little N and showing reduced growth accumulated but little rubber as compared with those at higher N levels. The greatest

rubber accumulation was in plants receiving 14-17 milliequivalents of N as nitrate per liter of nutrient solution; at the winter harvest they contained 5.5 percent rubber (dry weight of defoliated plant). Growth and rubber accumulation were both diminished in phosphate-deficient plants as compared with those receiving an abundant supply. No response to sulfate deficiency was evident. Growth and rubber accumulation were relatively independent of concentrations of Ca and K, but both were depressed under low Mg concentration. When plants were supplied with N in the form of Nitrate or NH_4, or mixtures of the two, those receiving the most or all of their N as NH_4 grew less and accumulated less rubber over an 8-mo. period than those receiving all or most of their N as nitrate.

Henequen from Cuba, A. H. LESTER (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 4 (1944), No. 4, pp. 69-72, illus. 5*).—An account of the status of henequen (*Agave fourcroydes*) growing in Cuba, practices involved in producing the fiber, and the outlook and its problems.

Milkweed goes to war (*U. S. Dept. Agr., 1944, AWI-94, pp [8], illus. 14*).—Suggestions on picking and handling milkweed (*Asclepias syriaca*) for floss (E. S. R., 91, p. 30).

The value of fertilizer for oats, R. COLEMAN and T. E. ASHLEY (*Mississippi Sta. Cir. 115 (1944), pp. 8*).—Fertilizer tests on different soil types in several localities in Mississippi showed that oats grown for grain should be top-dressed with N 32 lb. in February or March; for winter grazing N 32 lb. applied under the crop in the fall; and for both grazing and grain N 16 lb. under the crop in the fall and top dressing with N 16 lb. after the oats has been grazed. Ammonium and sodium nitrates have been superior to other N sources and return the greatest profit on investment, ammonium sulfate slightly less, and calcium cyanamide and uramon still less. On soils known to be P deficient both N and P materials should be added. From 500 to 1,000 lb. of lime per acre should be added on soils lacking lime.

The influence of crop rotation and date of planting on yields of dry edible peas in eastern Washington, 1943, M. T. BUCHANAN, A. W. PETERSON, and V. KAISER. (Coop. U. S. D. A.) (*Washington Sta. V Cir. 18 (1944), pp. 4*).—Pea yields averaged highest on farms of 167 growers in 1943 on land summer fallowed in 1942 and were followed by peas after legumes, after grain, after peas, and after 2 yr. of peas. The most common crop sequences were peas after grain, after peas, and after alfalfa or sweetclover. Farmers found it necessary to mow prior to harvest to facilitate harvesting operations about 38 percent of the peas after grain, about 65 percent after peas, and practically all peas after 2 yr. of peas. Highest yields were obtained for peas planted early, a significant reduction in yields occurring with delay in planting was delayed from early (April 10) to late (June 10). Relatively few growers applied gypsum or sulfur. Preliminary experimental results indicated that in 1943 gypsum applications increased pea yields about 20 percent.

Effect of soil acidity and some minor elements on the growth of Irish potatoes, W. C. BARNES (*South Carolina Sta. Rpt. 1943, pp. 127-132, illus. 2; abs. in Amer. Soc. Hort. Sci. Pros., 44 (1944), pp. 379-380*).—Potatoes grown on Nosbig fine sandy loam and Dupont very fine sandy loam with several pH levels and certain minor elements within the period 1939-43 returned yields indicating that application of either dolomitic lime or basic slag to these soils resulted in significant increases in yields, and that all potato land should be so limed as to maintain it at a pH range not lower than 5.0-5.5. One ton of lime per acre may be needed about once every 5 yr. to maintain soil of these types within the proper pH range

for potatoes. Addition of Mn gave no increase in yield, and application of magnesium sulfate to plats receiving dolomitic limestone resulted in no response. The best way to correct MG deficiency is to apply a magnesian lime to raise the soil pH to a 5.0-5.5 range. Indications were that application of K to an acid soil not containing an ample supply of Mg will not be of marked benefit to potatoes. If Mg is adequate, then K applications may be utilized by potatoes.

Losses in potatoes during storage, J. P. Drew and D. Deasy ([*Ireland*] *Eire Dept. Agr. Jour., 40 (1943), No. 2, pp. 306-314*).—This 2-yr. study into the effects of storing apparently healthy potatoes in pits under ordinary farm conditions is outlined and discussed. Unless the pits were so constructed as to exclude rain water, there were considerable losses from diseases and rots. Potatoes placed in the pits in November-December showed but little sprouting until February; from this time on it was necessary to examine at intervals and remove the sprouts. The percentage of starch and dry matter was not materially affected even after 5–6 mo. of storage, but taken in connection with the loss in edible tubers from spread of disease and decay the loss of total starch and dry matter may be appreciable.

Growing sorgo for sirup production, I. E. Stokes, W. S. Anderson, and B. Ferris. (Coop. U. S. D. A.). (*Mississippi Sta. Cir. 117 (1944), pp. 7, illus. 1; also in Miss. Farm Res.* [*Mississippi Sta.*] *7 (1944), No. 3, pp. 7-8, illus. 1*).—Cultural, fertilizer, and disease control practices described for the production of sorgo for sirup in Mississippi are outlined. Varieties described and currently recommended include Honey, Hodo, Iceberg, White African, and Sugar Drip.

Improved techniques of segmenting and planting sugar-beet seed, P. A. Reeve and M. J. Buschlen (*Michigan Sta. Quart. Bul. 26 (1944), No. 3, pp. 215-226, illus. 6*).—Sugar beet seed segmented by a machine built according to recommendations of the California Experiment Station were scarified (decrease of angularity of segments) best by a scarifier consisting of a series of sandpaper disks rotating within a stationary metal drum. Compared with whole seed, scarified segmented seed possessed higher test weight, seed units of smaller size, increased total germination percentage, increased proportion of seed units containing one viable germ, and fewer seed units containing two or more viable germs. A variation of 0.005 in. in the clearance between segmenting surfaces caused marked variations in characteristics of resulting segmented seed. Moisture content of whole seed has a marked effect upon recovery of segmented seed in the segmenting process; in general, as the moisture content increased, recovery decreased. Each seed lot must be segmented differently to obtain desired results. Screening segmented seed through a $^{9}/_{64}$-in. round-hole screen and over a $^{7}/_{64}$-in. round-hole screen resulted in maximum proportions of single-germ segments. Compared with nongravitated segmented seed (from California machine), "heavy gravity" seed possessed higher test weight, increased total germination percentage, and increased proportions of segments containing one and more viable germs.

When all seed plate parts were machined and chain and sprocket drives carefully adjusted to minimize play, a fairly accurate distribution of seed was secured with the plate-type planter using heavy gravity seed. Use of a plate $^{7.5}/_{64}$ in. thick with cells of $^{10}/_{64}$ in. diameter to plant "heavy gravity" seed resulted in the best distribution of seedlings with the highest percentage of row-inches containing single seedlings.

Sugarcane production in Mississippi, I. E. Stokes and T. E. Ashley. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 395 (1943), pp. 17, illus. 8*).—

Practical information on growing sugarcane for sirup deals with cultural and fertilizer practices, varieties (Co. 290 and C. P. 29/116), harvesting, and sirup manufacture. Information on sugarcane diseases and their control was furnished by E. V. Abbott and on insects attacking sugarcane and their control by J. W. Ingram.

Observations on sugarcane cultivation in Venezuela, A. Pickles (*Trop. Agr. [Trinidad], 21 (1944), No. 4, pp. 64-66*).—A general discussion of the sugar industry, environal features of sugar areas, cultivation practices, varieties grown, yields, pests and diseases, and possible lines of improving sugarcane cultivation.

Researches on drought resistance in spring wheat.—III, Size and frequency of stomata in varieties of Triticum vulgare and other Triticum species, J. E. Birdsall and K. W. Neatby (*Canad. Jour. Res. 22 (1944), No. 2, Sect. C, pp. 38-51*).—In continuation (E. S. R., 88, p. 169), significant differences were established between varieties and hybrid strains of wheat with respect to the length and frequency of stomata per unit area. In studies involving 12 species of *Triticum* and 4 different chromosome numbers, it was demonstrated that increasing the chromosome number is associated with larger and fewer stomata. Among both species and varieties within species, a negative correlation between size and frequency of stomata was indicated. Data on stomata were studied with relation to grain yield in the field, using the correlation coefficient; significant relations were established, and it was concluded that stomatal determinations may be used in selecting for high yield.

The classification of farmers' wheat samples: Progress report, the Oklahoma farm wheat improvement program (*Oklahoma Sta. Mimeog. Cir. 106 (1943), pp. 2+*).—A definite trend was noted in the production of the better grades of seed wheat. Farmers' wheat samples in 1942-43 averaged A grade 20.4, B 28.8, and C 50.8 percent compared with 8.5, 14.1, and 77.4 percent, respectively, 1939-41 (E. S. R., 87, p. 511).

Eliminate the element of chance in buying and using seed, M. T. Munn. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, p. 16*).—Certification, sealed bags, disease resistance, freedom from injury, proper storage, variety identity, and knowledge of source are discussed as important factors in crop seed quality.

Commercial agricultural seeds, 1943, G. P. Steinbauer (*Maine Sta. Off. Insp. 190 (1943), pp. 62-84*).—Percentages of purity, germination, weed seeds, and hard seeds (in legumes) and number of noxious seeds per pound are tabulated from 158 samples of farm crops seed collected from dealers in Maine in 1943.

Nature and rate of development of root system of Centaurea picris, J. C. Frazier. (Kans. Expt. Sta.). (*Bot. Gaz., 105 (1944), No. 3, pp. 345-351, illus. 5*).—Russian knapweed plants, grown from seed on a typical Kansas upland soil under known temperature and precipitation conditions and not subject to competition, were studied from the seedling stage through 72 weeks of growth. The root system of well-established plants consisted of the original (primary vertical) root, one to many permanent laterals, and their vertical extensions (secondary vertical roots). Horizontal spread was by a series of permanent laterals. Those of the first order arise on the primary vertical root and, unless injury or too severe competition prevents, successive orders of permanent laterals arise at or near the bend where one of the preceding order turns down to become a secondary vertical root. The plants had spread radially 6.5 ft. in the first and 11-12 ft. by the end of the second growing season; at that time several vertical roots had reached a depth of 10.5 ft. The source of shoot development, other than that from

the plumule, was from root-borne buds which produced either leafy shoots directly (if at the ground line) or rhizomes (if below the surface) which in turn gave rise to leafy shoots. These buds arose in greatest abundance at or near the bend separating a permanent lateral from its vertical phase. The shoot development of old plants was wholly from root-borne buds. The general type of development is the same as that of field bindweed and hoary cress. The rate for knapweed appeared to be about the same as the cress for the first 72–75 weeks; after the first 8–10 weeks from emergence, both developed somewhat more slowly than bindweed. The latter flowered during the first season; hoary cress and knapweed not until the second.

Control of noxious plants, H. K. Wilson. (Minn. Expt. Sta.). (*Bot. Rev.,* 10 (1944), *No. 5, pp. 279-326*).—This review (409 references) concerns those plants usually classed as weeds, the seriousness of which is seldom fully realized. The annual losses from weeds as compared with the more spectacular livestock diseases and insect pests have been estimated at 250 million dollars for diseases and plant poisoning of livestock, 1 billion for insect pests, and 3 billion for weedy plants. The discussion here centers around the characteristics and food reserves of weedy plants and means of controlling them by tillage, cropping, chemical (including the mechanism of action), and special methods. The weeds of turf grass are considered separately.

Chickweeds and cockles in North Dakota, O. A. Stevens (*North Dakota Sta. Bimo. Bull., 6 (1944), No. 4, pp. 10-12, illus. 4*).—Plants mentioned, with comments on their characteristics, include the corn-, pink-, and white cockles; night-flowering, smooth, and sleepy catchfly; common, mouse-ear, prairie, bluntleaf, and longleaf chickweeds; sand spurry; and whitlowwort.

HORTICULTURE

Combining genetically different samples for correlation analysis, L. F. Hough and E. L. Welker. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 155-159, illus. 3*).—"Correlation coefficients calculated for combinations of data obtained from two different sources may be invalid. If the two groups come from distinct parental populations in which means and variances differ, a correlation calculated from the combined data may be either larger or smaller than the correlation in either population. It may even be that while the components both have correlations of one sign, a combination of the two may exhibit a correlation of the opposite sign. Finally, nonlinear regression may result from combining data from separate populations or from two portions of the same populations. It is clear that the consideration of the components as separate samples will avoid possible incorrect interpretation of correlation and regression.

"In cases such as those presented, curvilinear regression or even apparently unreasonable straight line regression may be taken to indicate the possibility of the presence of genetically different groups within the sample."

Effect of soil reaction and some nutrient deficiencies on the growth of certain vegetable crops, W. C. Barnes (*South Carolina Sta. Rpt. 1943, pp. 136-140, illus. 4*).—Carrots and beets at the Truck Substation grew on soils having a pH range of 6.0–6.5 and reached their marketable stage 10–14 days earlier than when grown on soils of a pH range of 5.0–5.5. No marketable roots were produced on soils more acid than pH 5.0. Mg deficiency in carrots is characterized by a yellowing of the older leaves. In beets, Mg deficiency was manifested in deep reddening of the leaves. The addition of Mn and Mg to unlimed soils resulted in only negligible increases in the growth of beets and carrots. It is suggested

that Mg may be supplied best in the form of dolomitic limestone or basic slag. Lettuce was found to be extremely sensitive to soil acidity, with plants grown at pH 6–6.5 maturing earlier and producing better quality heads. The reaction of cabbage to soil acidity and nutrient deficiencies varied with the season and with growth conditions. Mg deficiency in cabbage showed first as a slight yellowing between the veins of the older leaves; chlorosis followed; and finally the affected areas turned brown. Snap beans proved less sensitive to soil acidity than any of the other crops.

Lengthening the garden season and increasing vegetable yields, L. C. SNYDER (*South Dakota Sta. Bul. 374 (1944), pp. 19, illus. 6*).—On the basis of experiments at the station in 1942 and 1943, the use of transplants is recommended for all long-season crops in South Dakota and for certain cool-season crops that must mature before warm weather. Transplanting produced the highest yields with broccoli, brussels sprouts, cabbage, cauliflower, celery, eggplant, head lettuce, onions, peppers, and tomatoes. Succession plantings greatly increased the length of the garden season with spinach, leaf lettuce, cabbage, kohlrabi, beets, carrots, green onions, radishes, snap beans, and peas. Legume inoculants benefited peas and the various kinds of garden beans. Plant protectors were effective against frost, but there was danger of overheating the plants. Of various fertilizers, a complete 4–12–4 used as a side dressing gave the best results in the experiments. Well-rotted manure at a rate of 20 tons per acre gave nearly as good results. Treble superphosphate ranked third. Irrigation proved helpful in 1943, and even greater benefits might be expected in a drier season. The use of semishade proved harmful.

Vegetable varieties for commercial production in Michigan, K. C. BARRONS (*Michigan Sta. Cir. 191 (1944), pp. 35+, illus. 17*).—Information is presented on the outstanding characteristics of the more important vegetable varieties for commercial production in Michigan.

Irrigating the home garden, A. S. CURRY (*New Mexico Sta. Bul. 313 (1944), pp. 8, illus. 7*).—A popular discussion of methods.

Fungicides and insecticides, 1943, E. R. TOBEY (*Maine Sta. Off. Insp. 190 (1943), pp. 85-95*).—In the usual form (E. S. R., 89, p. 214) there are presented the results of analyses of 46 samples of fungicidal and insecticidal materials collected in 1943.

Yields of hardy snap bean strains, B. L. WADE and M. S. KANAPAUX. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 239-245*).—A number of new strains of snap beans derived from crosses of U. S. No. 5 Refugee with Stringless Black Valentine, Bountiful, and Brittle Wax were grown at Charleston, S. C., in the spring and fall of 1940 and 1941 in comparison with commercial varieties. Earlier trials had shown that many of the new strains were unusually good producers under summer conditions which prevented the successful fruiting of the commercial sorts. In addition, many of the new strains showed a capacity to produce seed year after year at Charleston, while the commercial varieties failed within a few generations. The ability of the new strains to withstand summer conditions was derived from the U. S. No. 5 Refugee or other closely related varieties. Several of the new beans have been released under names. For example, VBL (Vegetable Breeding Laboratory) No. 8, VBL 19, and a selection from VBL 41 have been named Cooper Wax, Ashley Wax, and Logan, respectively. In addition, in cooperation with the Florida Experiment Station, two selections from VBL 21 and VBL 28 have been released as Florida White Wax and Florida Belle, respectively.

Sweet corn for the Upper Peninsula, P. H. BOWSER (*Michigan Sta. Quart.*

Bul., 26 (1944), No. 3, pp. 171-172).—Information is presented on the average date of maturity, time required to reach maturity, yields, length of ears, and quality rating of a number of sweet corn varieties and hybrids grown at the Upper Peninsula Substation at Chatham where, because of the short growing season, earliness becomes a prime requisite. Many of the early varieties, such as Seneca 60 and Spancross, had better quality at Chatham than when grown in southern Michigan. A list of recommended early, midseason, and late varieties is offered.

Fruit growth and food transport in cucurbits, A. S. Crafts and O. A. Lorenz. (Univ. Calif.). (*Plant Physiol., 19 (1944), No. 1, pp. 131-138*).—Fruits of the Connecticut Field pumpkin and the Early Prolific Straightneck summer squash were measured while small and then remeasured at given intervals during the growing period. After harvest the areas of phloem in the fruit stalks were measured. For the Connecticut Field Pumpkin it was found that dry food materials would have to pass through the peduncles at an average rate of 16 cm. per hour to account for the observed fruit growth. For a 7-day period the rate was over 31 cm. per hour. Similar calculations based upon measurements of fruit and phloem areas indicated transport rates of 11.0 and 13.4 cm. per hour for Connecticut Field pumpkin and Early Prolific Straightneck squash, respectively. Such rates, when converted to linear displacement values for solutions, indicate movement at rates of 55–160 cm. per hour for transport by mass flow. By activated diffusion along the cytoplasm the above rates indicate diffusion rates of 1,000 cm. per hour or more.

Herbs, J. A. Martin (*South Carolina Sta. Rpt. 1943, pp. 49-50*).—Tests of various herbs were begun in 1943 to determine better cultural methods, cost of production, and the adaptability of various species. Condiments which appear to offer the greatest possibilities include cayenne pepper, Japanese pepper, paprika, fennel, sage, sesame, thyme, dill, and sweet marjoram. Medicinal plants under trial included belladonna, digitalis, pyrethrum, *Tephrosia virginiana,* jimsonweed, and valerian. Other plants tested include goldenrod and Russian dandelion for rubber, *Hibiscus manihot* for mucilage, and the luffa for use in the war industry.

Tests with newer lettuce strains, G. J. Raleigh, J. F. Harrington, R. Kunkel, and R. D. Sweet. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 185-186*).—A cross of Brittle Ice and Imperial 152 (U. S. D. A. 8355M) contained plants of greater resistance to tipburn and possessing firmer heads than the Imperial 44 variety. In 1940, three strains, two of which were selections from Imperial 152 and one from 10899M (itself a selection from Imperial 152), were outstanding. In 1941, the selection from 10899M was found the best of the three and was introduced in cooperation with the U. S. Department of Agriculture as No. 456. Lettuce No. 456 has unfortunately a tendency to form ribby heads. Efforts to remove this tendency by crossing back with Imperial lines resulted in an increase of tipburn susceptibility. Great Lakes, a variety introduced by the Michigan Experiment Station and the Department, showed more tipburn than did No. 456, but both Great Lakes and No. 456 rate as more dependable lettuce for summer production than does Imperial 44. In one instance No. 456 failed to produce a marketable crop due to aster yellows, a disease to which no known lettuce variety shows any resistance.

Lettuce varieties for New York undergoing improvement, G. J. Raleigh. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 9, 15, illus. 1*).—Of several new varieties of lettuce of the crisp-head type developed to replace the old Boston-type lettuce grown previously in the State, Imperial 44 and a new lettuce designated as No. 456 have proved valuable. No. 456 forms hard heads under conditions when Imperial 44 is puffy and badly

tipburned. Unfortunately no lettuce variety possesses resistance to yellows. The relation of fertilizers to the development of tipburn is discussed.

Iroquois muskemelon is resistant to fusarium wilt, H. M. MUNGER. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, p. 20, illus. 1*).—An account is given of the origin and development of a new muskmelon designed for production on the fusarium wilt-infested soils of western New York. 8The new variety is compared with the older variety Bender with respect to disease resistance, size, quality, etc.

Studies in the physiology of the onion plant.—I, An investigation of factors concerned in the flowering ('bolting') of onions grown from sets and its prevention; Part 1, Production and storage of onion sets and field results, O. V. S. HEATH (*Ann. Appl. Biol., 30 (1943), No. 3, pp. 208-220, illus. 5*).—Among factors found of material influence in affecting the tendency of onion sets to form premature seed heads (bolting) were size of set and the temperatures maintained during storage. Large sets were much more liable to bolting than were small sets. Sets produced at high temperatures under glass were practically free from bolting, irrespective of subsequent storage conditions. Storage throughout the winter at 30° C. (86° F.) practically eliminated bolting. Cold storage, 32° F., throughout the holding period or for the first portion thereof reduced bolting. Cold storage for the latter portion of the storage period tended to increase bolting. High storage temperatures led to a loss in weight and increased mortality upon planting.

Onion-set production, J. C. WALKER, W. C. EDMUNDSON, and H. A. JONES (*U. S. Dept. Agr., Farmers' Bul. 1955 (1944) pp. 21+, illus. 18*).—This supersedes the sections on onion sets in Farmers' Bulletin 434 (E. S. R., 25, p. 39). It deals with cultural methods under irrigation and humid conditions, insect and disease control, and harvesting, curing, storing, and processing the sets.

Fertilizers for cannery peas, J. F. DAVIS and R. L. COOK. (Coop. U. S. D. A.). (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 200-206, illus. 3*).—Comments are presented on the status and cultural requirements of cannery peas. The results of fertilizer placement studies showed that fertilizer in contact with pea seeds may reduce significantly the stand and yield. The use of the same amount and kind of material in bands placed to the side and below the seeds resulted in no injury and raised yields significantly. The prevailing climatic conditions in any given season were observed to influence the amount of stand injury and the responses to fertilizer treatments. In general, the increases in yield obtained from the inclusion of nitrogen materials in the applied fertilizer were not sufficient on soils of good natural fertility to warrant its use and led to the recommendation that a 0–14–7 or a 0–20–10 NPK material should be used on cannery peas. On light-colored soils or on nonlivestock farms where nitrogen may be lacking, a complete fertilizer of the composition 2–16–8, 2–12–6, or 4–16–4 may be used at the rate of 300 lb. per acre.

Cayenne pepper improvement, J. A. MARTIN (*South Carolina Sta. Rpt. 1943, pp. 45-46, illus. 1*).—A brief account is presented of selection studies with the cayenne-type and the Japanese-type peppers, begun in 1942 as preliminary to a proposed hybridization program to improve the cayenne variety. At the present time pepper growers are hampered by the highly variable nature of their product, which includes sharp differences in pod shape and size, pungency, productivity, and other characteristics which combine to make a desirable marketable pepper.

Vegetable soybean varieties, W. T. TAPLEY. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 1, 4*).—

Information is presented on the soybean as human food and on the results of tests of 19 varieties grown in 1943.

Breeding summer tomatoes for increased size, L. R. Hawthorn. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc. 40 (1942), pp. 390-394*).—This reports progress in increasing the size of the Summerset variety of tomato, a summer-fruiting home-garden variety developed by the author. A cross was made between Summerset and Bison, a rough large-fruited sort setting well in southwest Texas in late summer. A small proportion of the second generation had relatively large fruits and set well during late summer. All were comparatively rough. Selections in the third generation set as well as Summerset, with fruit three to four times its size, but the fruit was rougher than that parent and lacked its excellent interior color.

pH of extracted cell sap and phosphorus content of young tomato plants growing on varying levels of phosphorus, E. W. Kalin. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 235-238*).—Studies with Indiana Baltimore tomato plants started in quartz sand and transferred to nutrient-supplied sand cultures when showing their first leaves showed that the plants in sand need only 15 p. p. m. or less of P in the nutrient solution for their optimum growth. The pH of the cell sap of young tomato plants was from 5.8 to 6.0 when the pH of the nutrient solution was constant at 6.0 even though the P level was varied from 1 to 60 p. p. m. The pH of the cell sap of the stems was more acid than that of the leaves and petioles. In young tomato plants the rate of P absorption is not directly proportional to the P concentration in the nutrient solution. On the other hand, the amount of P found in the leaves and stems was closely correlated with the supply of P in the nutrient solution. The leaves contained more P than the stems, regardless of the amount of P in the solution.

Tomato production in Mississippi, L. R. Farish, E. L. Moore, and E. A. Currey (*Mississippi Sta. Bul. 399 (1944), pp. 20, illus. 10; also in Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 3, pp. 3-6, illus. 8*).—This discussion of practices deals with soil management, preparation, and fertilization; plant production; time and method of setting plants; spacing and pruning; varieties; and control of insects (by C. Lyle) and diseases (by J. A. Pinckard).

On the basis of investigations at Crystal Springs and State College, 1939-43, two stems per plant were found more profitable in Mississippi than one stem, with spacing from 18 to 24 in. in the row when pruned to two stems and staked. Variety tests revealed Scarlet Dawn and Gulf State Market as the leading nonresistant varieties in yield and quality of fruit when grown in wilt-free soils. Rutgers, Master Marglobe, Stokesdale, and Essary were found outstanding among the wilt-resistant varieties.

Watermelon variety test [at the Edisto Substation], C. J. Nusbaum (*South Carolina Sta. Rpt. 1943, pp. 165-167*).—Tests of fusarium wilt watermelons obtained from other States in comparison with the susceptible kinds revealed three from Florida that were entirely free from the disease. All of the wilt-resistant watermelons showed marked resistance. Brief descriptions are offered on the resistant varieties, with data on yield and on the incidence of fusarium wilt.

Care of newly set tree fruits and small fruits, T. H. Jones (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 3, pp. 1, 2*).—Information is offered on plantings, training, and pruning, cultural methods, fertilizer requirements, etc.

Ammonium nitrate has value as orchard fertilizer, R. C. Collison. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, p. 18*).—Ammonium nitrate carrying about 35 percent of actual

nitrogen is now available to New York State fruit growers in a granular and useful form. Trials conducted by the Station show that it compares favorably with other nitrogen carriers for orchard use. Similar trials by the vegetable crops division showed the new material to be desirable as a top dressing for beets.

Getting the orchard sprayed, H. D. HOOTMAN (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 207-210*).—Spraying is described as the most important of all orchard operations, and the failure to time the spray properly or the missing of a single necessary application may result in serious losses. A spray schedule for apples designed to control rosy aphid, red mite, codling moth, and scab is presented and discussed.

Dwarfing rootstocks and the small early-bearing apple tree, H. B. TUKEY. (N. Y. State Expt. Sta.). (*Amer. Fruit Grower, 64 (1944), No. 2, pp. 13, 30-33, illus. 4*).—Arranged in order of the size of trees that they produce, descriptive comments are presented upon the more promising Malling rootstocks, together with information as to their compatibility with horticultural varieties and upon the subject of dwarf fruit trees in general.

Some apple varieties thinned by sprays at full bloom, M. B. HOFFMAN. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 5, 14, illus. 1*).—The possibilities of using chemical sprays to reduce the set of fruit of normally biennial varieties in their "on-year" and thus make possible a greater set of fruit buds for the "off-year" are discussed. Promising results were obtained with one proprietary material. The importance of proper timing of the sprays is stressed, and information is given on dilutions, foliage injury, varietal susceptibility, etc.

Influence of climatic conditions on date of full bloom of Delicious apples in the Wenatchee Valley, G. P. SISLER and E. L. OVERHOLSER. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943),pp. 29-34*).—Of several climatic factors considered as possible influences upon the time of bloom of the Delicious apple in the Wenatchee Valley, Wash., air temperature alone appeared to have any definite and fairly consistent effect. A total of approximately 1,000° F. of accumlated temperatures, above a daily maximum of 43°, from February 1 was needed to bring the Delicious into full bloom. An analysis of the records suggested that, unless the temperatures during April are either unseasonably cool or warm, certain generalizations as to the date of full bloom of mature apple trees may be based on the cumulative degrees of temperatures above 43° from February 1 to April 1. The expected dates of bloom for (1) 780° and above, (2) 585°–700°, (3) 430°-500°, and (4) 300°–410° were, respectively, to April 15, April 18–20, April 22–25, and April 27 to May 2.

A pomological and cytological study of a russeted sport of the Stark apple, C. P. SWANSON and V. R. GARDNER. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 8, pp. 307-315, illus. 5*).—A description is presented of a russet bud sport of the Stark apple found in a commercial orchard near Fennville, Mich. The russeting was generally thin and even but showed considerable variability within trees and between seasons. Coarse russeting was correlated with deep cracking and a decreased weight of the fruit. The bud sport showed a tendency to revert to normal and also toward a more extreme form of russeting. With the exception of one normal branch, the other mutations appeared to be conditioned by environmental factors. The bud sport had a diploid chromosome number of 51 as compared with 42 in the normal Stark tree. The branch showing complete reversion to normal had 42 chromosomes, and one branch showing partial reversion had 46. The other partial reversions showed no change in chromosome number. The

authors suggest that the 51-chromosome sport arose from the 42-chromosome parent by the addition of chromosomes, possibly through somatic nondisjunction, and that the 46-chromosome branch resulted from a loss of chromosomes in the branch meristem. The complete reversion may have resulted from active cells carried over from the parental tree through the graft. The russeted Stark apple is evidently a complex chromosomal chimera, and the outcropping of various tissues having different numbers has resulted in the establishment of further variants.

Comparative hardiness of peach varieties and selections, F. M. Coe (*Farm and Home Sci.* [*Utah Sta.*], *5 (1944), No. 1, p. 12, illus. 1*).—A large collection of peach and nectarine varieties and selections was assembled near Logan to test their hardiness under rather difficult environmental conditions. The evaluation following the severe winter of 1941-42 showed injury ranging from light twig killing and blackening of tissues to the death of all material above the snow line. Among varieties included in the group showing maximum resistance to injury were Veteran, Larson Old Fashioned Elberta, and Halehaven peaches and John Rivers nectarine. The records refer only to hardiness of wood since none of the trees bore fruit in 1942.

Peach orchard cover crop practice varies to suit soils and seasons, N. J. Shaulis and C. O. Dunbar. (Coop. U. S. D. A.). (*Pennsylvania Sta. Bul. 446 (1944), Sup. 2, pp. 2-3, 9, illus. 3*).—Severe erosion in Pennsylvania peach orchards has followed the continuous use of clean cultivation. Numerous cover crops were tested in Adams County peach orchards. Some, such as sweetclover and alfalfa, drew too heavily on soil moisture and also harbored injurious insects. Korean lespedeza controlled erosion and permitted satisfactory tree and fruit growth, but harbored stinkbugs. Ryegrass was useful when properly managed and plowed under early. A promising mixture for Adams County peach orchards comprised crimson clover, winter vetch, millet, and rye. When seeded in July, the millet shaded the young clover and vetch plants, and the rye added bulk to the cover.

Effects of various cover crops upon the growth of Elberta peach trees, J. T. Bregger and A. M. Musser. (Coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1943, pp. 40-42*).—Information is offered on the growth responses of Elberta peach trees planted in 1939 on the contour and managed differently with respect to cover crops. Measurements at the end of the first 5 yr. of growth showed that trees without a cover crop but with a grain-straw mulch of fallow had made the greatest total growth. However, trees with a vetch winter crop followed by a summer cover crop made almost as much growth and in the year 1943 made the most growth of any plat. Lespedeza cover crops restricted growth greatly during the first few years. From the records it would appear that cultivation or mulching is essential in the early development of the peach tree under the existing conditions.

Pollen studies with plums representing certain species and interspecific hybrids, W. S. Flory, Jr., and M. L. Tomes. (Tex. Expt. Sta.). (*Tex. Acad. Sci. Proc. and Trans., 25 (1941), pp. 51-52*).—From studies made in 1940 and 1941 on pollen of available plum varieties and species, summary data are presented on (1) percentages of normal grains, (2) germination percentages of grains grown on a nutrient medium, and (3) average size of grains.

Plums in Michigan, R. E. Loree (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 196-199, illus. 7*).—Herein is presented a brief survey of the plum-growing industry, with variety descriptions and recommendations for Michigan.

Raspberry breeding has several major objectives, G. L. Slate (N. Y. State Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10 (1944), No. 2, pp. 4, 8-9*).—The methods, objectives, and results of the Station raspberry

breeding program are outlined. Of nearly 15,000 red raspberry seedlings which have been produced by the Station since 1892, 16 have been named and distributed.

The cashew, H. H. Conrad (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 4 (1944), No. 4, p. 79*).—The cashew is believed to be a native of Brazil, growing in all parts of that country but most abundantly in the northwestern section. Information is presented on the tree and nut, methods of handling the crop, etc. The leaves when broken into bits serve as a dentifrice. The oil from nutshells serves as an insect repellent, for lubrication purposes, etc. The bark exudes a gummy substance that may be used as a substitute for gum arabic. The lumber is valuable for making furniture, packing cases, and boats.

Changes in some mineral constituents of pecan nuts and their supporting shoots during development, R. D. Lewis and J. H. Hunter. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 8, pp. 299-306*).—Samples of nut-bearing shoots were collected from Moore pecan trees growing on Greenville sandy loam at Albany, Ga., on July 15, August 15, September 15, and October 3, 1939. The total contents of ash, N, P, Ca, Mg, and K were determined in the nuts and in the shoots.

The percentage composition of the pecan nut and of its supporting shoot is influenced to a high degree by the stage of development of the nuts. In the last month of the period of growth in size, the actual dry weight of the nut increased at such a rapid rate that the percentage of mineral constituents in the dry matter showed highly significant decreases even though they continued to accumulate in the nut in highly significant quantity on the basis of units per nut. The shoot increased in dry weight and in the content per shoot of all the minerals except Mg and P. In the second and third periods studied, during which the kernels developed and filled, N, K, Mg, and P accumulated in the nuts at rates exceeding the accumulation of dry matter even though the dry weight of the nut itself increased at a rapid rate. Ca accumulated in the nut in very small quantities. The shoots lost significant quantities of all the minerals. Ca was deposited largely in the shell of the nuts, while N, K, P, and Mg were found to a greater extent in the kernels. The composition of the whole nut did not give a true picture of the changes occurring during kernel development. It was evident that it is highly important that the pecan trees be supplied with sufficient minerals in the proper balance so that mineral and organic reserves will not be greatly depleted in the shoots by a heavy nut crop.

Flowers that fight malaria, R. E. Culbertson (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 4 (1944), No. 4, pp. 66-68, illus. 3*).—Pyrethrun has proved highly valuable in combatting insect enemies of American troops. The material is obtained from the dried flowers of *Chrysanthemum cinerariaefolium.* With the normal sources cut off by the war, progress has been made in developing the crop in the highlands of Peru and Ecuador. Information is presented on cultural requirements, handling of the flower crop, seed production, etc.

Lagunas—barbasco capital of the world, E. C. Higbee (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in America, 4 (1944), No. 5, pp. 83-86, 95, 96, 97, illus. 5*).—The barbasco plant is an important source of rotenone, one of the insecticides of vital importance in the production of food crops for the Allied Nations. This article relates how the farmers of Lagunas, Peru, are contributing to the production of this valuable insecticide.

Low temperature and flower bed development of azaleas, K. Post. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 307-310*).—Storage treatment at 40°–41° F. of Coralbells and Triumphe azaleas, after the buds were well formed, caused uniform bud development and flowering after 4 and 6 weeks of

storage, respectively. Flowering to a salable stage occurred in 4 and 6–7 weeks for the two varieties, respectively, after storage and placing at 60°. More uniform flowering of both types of azaleas occurred when the storage treatment was given than when given the normal coldframe treatment. Artificial light supplied during cold storage had no effect. Excellent salable plants of Coralbells and Triumphe azaleas were obtained on October 1 and later and on November 15 and later, respectively. Coralbells held in storage 8 weeks or more produced smaller flowers with lighter color than did plants given a shorter storage treatment.

The effect of an interval of long days in the short day treatment on the flowering of chrysanthemums, K. Post. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 311-315*).—A number of varieties of pompom chrysanthemums, after a preliminary treatment with short days beginning July 3, were subjected to interim periods of long days, following which the short days were resumed. All varieties did not react the same under the treatments, probably because of varietal differences in the length of short-day treatment required to develop the buds to various stages. Apparently the long-day interval of 5–20 days given after 28–35 days delayed the date of bloom by a maximum of 8 days as compared with continuous short-day treatments. The size of flowers was increased slightly and the individual flower heads were on longer peduncles, allowing the flowers to stand farther apart when the long-day interval was given. No consistent effect was evident on the weight and the number of stems per plant, but varied with the variety and treatment. As the number of stems per plant was increased, the weight per stem usually decreased.

Factors influencing the germination of iris seed and the relation of inhibiting substances to embryo dormancy, L. F. Randolph and L. G. Cox. (Cornell Univ. coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 284-300*).—Iris seed remained dormant under normal conditions for several months followed by partial, irregular germination over a period of several years. The percentage germination of different samples of iris seed varied greatly. Embryos of freshly harvested as well as air-dried seeds germinated within a few days after being transferred to sterile nutrient agar, and within a few weeks 90 percent of the plants had developed into seedlings suitable for transplanting to soil. Many of these seedlings flowered the following year, thus reducing to less than 1 yr. the interval from seeding to flowering. Apparently inhibiting substances present in the endosperm of the mature iris seed prevent further growth of the embryos. Attempts to inactivate the inhibiting substances without cutting out the embryo were only partly successful, suggesting that the inhibiting materials are highly stable compounds, relatively insoluble in water and not readily diffusible from the region of the embryo. Air-dried iris seed stored in ordinary packets remained viable for 12 yr., and storage for at least several years had no appreciable influence on germination.

The influence of flower removal on gladiolus corm development, A. N. Roberts and J. A. Milbrath. (Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 319-322*).—The effect of flower removal as a means of increasing corm size in gladiolus was not consistent with all varieties, and the gain was only slight with most varieties. There appeared no advantage to corm production in removing the flowers of early-blooming varieties, and if any foliage was removed with the flowers it was decidedly harmful. On the other hand, with late-blooming varieties there was noted considerable increase in corm size following the removal of the flowers. Midseason varieties were intermediate in their response to flower removal. The loss in corm size due to cutting flowers for the florist trade was in direct proportion to the amount of leaf surface removed.

The effect of sulphur on growth of roses in an alkaline soil.—II, Results for 1940 and 1941, J. C. RATSEK. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 565-568, illus. 2*).—In continuation of this study (E. S. R., 84, p. 195), Talisman and Radiance roses grown in calcareous soils responded in growth to applications of sulfur used to acidfy the soil. Small applications of sulfur that reduced the pH to around the neutral point resulted in a depression of growth over the untreated plants. Increasing amounts of sulfur resulted in increased growth until at pH 5.5–6.0 the growth was appreciably higher than the untreated plants. The response was much like the isoelectric response of proteins. Chlorosis decreased with lowered pH.

Effects of moisture and nitrate concentrations on growth and bud drop of sweet peas, K. POST. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 278-280*).—Sweet peas were transplanted about the middle of August to greenhouse beds containing a composted soil, in which two sharply contrasting nitrate levels were maintained. A high level was obtained by adding nitrate of soda at intervals and a low level by adding a carbonaceous material, namely, chopped sugarcane. Soil moisture levels were also compared on certain of the plats. Flowers were picked from November through January. The production of flowers, the length of stems, and bud drop tended to be greater on the low-nitrate plats. The trend, with less water, was for more flowers, shorter stems, and less bud drop but the differences were not significant.

Adventitious root initiation in Forsythia suspensa, J. C. SWARTLEY. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 301-306, illus. 6*).—Anatomical studies were made upon the adventitious roots developed by softwood cuttings of *F. suspensa,* collected April 15 and placed in sand in a propagating house. Young root primordia were detected in stems that had been in the rooting medium for 18 days. The primordia in the bud developed from meristematic cells in outer portions of the procambial strand. The primordia in the stem developed from cells in the region of the vascular cambium on either side of the branch trace. Phloem paremchyma becomes meristematic and contributes to the developing primordia. In immature, partially etiolated leaves, most primordia form from undetermined cells in the region of the small accessory bundle and develop through the lower or rounded part of the petiole. In more mature leaves, most primordia form from the main bundle and develop through the upper or grooved part of the petiole. Treatment with synthetic substances did not noticeably affect the number or origin of nodal roots but did increase the number of internodal roots. Very few untreated cuttings developed internodal roots.

Studies on the propagation of certain broadleaf evergreens, with special reference to leaf-bud cuttings and root-inducing substances, H. H. WILLIAMS (*Amer. Soc. Hort. Sci. Proc., 43 (1943), pp. 323-330*).—In December 1939 cutting material of several broadleaf evergreens received from nurseries in Alabama, Georgia, Ohio, and Virginia was treated with root-promoting chemicals in the the form of liquids and dusts. No positive advantage was found for dusts over liquids relative to the mechanics of treatments alone. All treatments within the tolerant range of the plants showed an advantage over the controls, both as to quantity and quality of roots and in subsequent top development. Roots from dusted cuttings were usually longer and more branched than those of the liquid-treated roots. Subsequent measurements revealed a greater amount of roots as well as shoot growth in favor of dusting. Leaf-bud cuttings compared favorably with stem cuttings in most of the species. For a given amount of cutting material, the subsequent total shoot growth was much greater for leaf-bud than for stem cuttings.

Cuttings taken from current wood responded more favorably to all the treatments from the standpoint of both greater rooting percentages and shoot production. Cuttings of *Ilex* spp. treated with solutions were dwarfed and produced a heavy set of parthenocarpic berries. It is thought that these dwarfed hollies may have use as Christmas plants.

Hevea budgrafting improved (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in America, 4 (1944), No. 4, p. 62*).—Young Hevea trees were observed by A. White and E. P. Imle to produce successive flushes of leaves with the terminal bud remaining quiescent between bursts of growth. Budwood taken at the end of a rest period gave a 50-percent advantage over that taken in the active period if there was a delay between cutting and insertion in the stocks. Girdling young Hevea plants from 9 to 14 days before cutting budwood increased the percentage of budding success.

FORESTRY

Some plain facts about the forests (*U. S. Dept. Agr., Misc. Pub. 543 (1944), pp. 22+, illus. 12*).—Answers are given to 17 questions dealing with timber supply; growth and drain; tree planting; forest ownership; interests in the forest of labor, farmers, and the average citizen; and the outlook for the future.

Ecological composition of pulpwood forests in northwestern Maine, H. J. Oosting and J. F. Reed (*Amer. Midland Nat., 31 (1944), No. 1, pp. 182-210, illus. 1*).—The extensive Maine forests are almost entirely second growth resulting from a sequence of changing lumbering operations from about 1800 to the present. Cutting was decidedly selective until relatively recent times, except in clearings of land for agriculture. The lumber market first demanded white pine and then spruce; paper-mills later created a demand for pulpwood which began with spruce, progressed to fir, and finally included hardwoods. Most stands were thus cut several times and are now or soon will be clear-cut. Under such conditions it is obvious why silvical or ecological principles have had little consideration. Studies bearing on planned silviculture have all been made within the past 45 yr. and, because of the recent general adoption of clear-cutting, only a limited number of them contribute materially; purely ecological studies of the pulpwood forests are even fewer. In the typical Maine forests analyzed, the important species of the dominant stratum in the spruce flat and spruce-hardwood stands were red spruce and balsam fir with a mixture of hardwoods including red and sugar maple, yellow birch, and ash in the former and white and yellow birch and red maple in the latter. In the essentially coniferous spruce slope and old-field stands red spruce and balsam fir made up most of the overstory with scattered paper birch; yellow birch was also present in the old-field and mountain ash in the spruce slope. In the subdominant stratum only spruce and fir consistently occurred in all stands. The spruce flat and spruce-hardwoods had additionally a mixture of numerous hardwoods, but the spruce slope and old-field subordinate individuals were almost entirely conifers. Analysis of the sapling and seedling strata of tree reproduction indicated no radical changes to be expected in the generalizations made for the composition of strata of tree size. But for occasional exceptions, shrubs were absent in all stands except the spruce flat. Herbs were most abundant in species and numbers in the spruce flat and spruce-hardwood stands. Floristically, two types of pulpwood communities exist in the Swift River region analyzed, viz., pure coniferous forests on the abandoned farm lands and high on the slopes of the mountains, and mixed spruce-hardwood forests on the lower slopes and along the better drained water courses of the lowlands. It

is believed from this study that the practice of clear-cutting will serve better than any other type of lumbering to preserve the forest of this region relatively unchanged in type and composition.

Guides for cutting timber in the Northeast (*U. S. Dept. Agr., 1944, AWI-90, pp.12*).—Suggestions are given to aid in timber cutting on six eastern-type forests, namely, Allegheny hardwoods-hemlock woodland, eastern white pine, loblolly pine of the Eastern Shore, oak forests in the Northeastern and Middle Atlantic States, New England hardwood forests, and red spruce in the Northeast. A timber-estimating form is included.

Winter hardiness in juvenile and adult forms of certain conifers, V. R. GARDNER. (Mich. Expt. Sta.). (*Bot. Gaz., 105 (1944), No. 3, pp. 408-410, illus. 3*).—Anatomical and morphological differences between adult and juvenile forms of many conifers have long been known; few observations have been recorded, however, on the physiological differences among these several forms of the same species. A number of plants of *Juniperus chinensis variegata* and *J. horizontalis* near Grand Rapids, Mich., afford such an opportunity. The 1942 shoot growth was considerably greater and more vigorous on the juvenile than on the adult parts and therefore theoretically should have been less mature in the fall. Though the following winter was not especially severe, practically all the adult leaves and the small twigs bearing them were dead on both forms of juniper in the spring of 1943, whereas the leaves and wood of the reverted juvenile branches were uninjured. In no case had the juvenile parts had any advantage as to exposure to temperature, wind, or sunlight; it was clearly a case of differing hardiness between the two forms. It was also observed that the reverted branches of *J. horizontalis* bearing juvenile foliage had rooted more freely on contact with the soil than had branches of the normal form with adult foliage.

Cork culture in the United States, G. B. COOKE (*Sci. Mo., 58 (1944), No. 5, pp. 357-364, illus. 7*).

DISEASES OF PLANTS

The Plant Disease Reporter, [March 15, April 1, and April 7, 1944] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr., 28 (1944), Nos. 6, pp. 171-241, illus. 2; 7, pp. 241-278, illus. 3; 8, pp. 279-326*).—The following are included:

No. 6.—Tree diseases observed in Wisconsin, including recent observations and unreported records taken earlier in the 1943 season on forest tree diseases and wood decay fungi, by E. E. Honey; results of the brown rot survey, and notes on some other diseases of stone fruits in central California, by H. L. Barnett and E. W. Bodine; corn leaf diseases observed in North Carolina in 1943, by S. G. Lehman; diseases in stored grain and soybeans in Iowa, by E. F. Vestal; reports on diseases of cereal crops in Texas; an undetermined wilt of the blue lupine (*Lupinus angustifolius*) in Alabama and *Rhizoctonia* collar rot in Georgia; diseases on sweetclover in Louisiana and Texas; diseases of vetch (Ala., Miss., La., and Tex.); diseases reported on other leguminous forage and cover crops in Southern States; diseases of vegetable crops in Idaho in 1943, by G. KenKnight and E. C. Blodgett; a *Botrytis* leaf spot of onions new to Florida, by E. West; onion "blight" (cause not definitely known) in the coastal bend (Robstown) area of Texas, by G. E. Altstatt; onion spraying for mildew and thrips control in New York State, by W. E. Rader and D. Ashdown; a virus disease of lettuce occurring in Indiana greenhouses, by R. W. Samson; diseases reported in greenhouse-grown vegetable crops (Ind., Ill.,

and Mo.); vegetable diseases in winter truck crop areas (S. C., Ga., Fla., Miss., La., Tex., Wash., Oreg., and Calif.); nematode survey in Florida, by A. L. Taylor; condition of war-approved seed potatoes in Ohio, by M. R. Harris; potato diseases in storage and transit, including transit rot in potatoes shipped from Maine, condition of Maine potatoes stored in Rhode Island, potato storage diseases in Rhode Island, condition of stored potatoes in Connecticut, potato storage diseases in Indiana and western Washington, and use of air-conditioning machinery for controlling potato storage in western Oregon; sweetpotato storage diseases in South Carolina and Georgia and sweetpotatoes in hill storage in Alabama; squash storage diseases in New England and condition of stored apples in New England, by R. Cassell; and brief notes on tobacco downy mildew in Georgia, diseases of sugar beet in the Imperial Valley of California, and *Cercosporella* spot on broccoli.

No. 7.—Outstanding potato late blight control in Florida with a new organic fungicide combined with zinc sulfate, by G. D. Ruehle; early blight tuber rot of potatoes in Minnesota and the Dakotas, by I. W. Tervet; reports on late blight on eggplant, tomato, and potato in the Florida west coast area and on potato and tomato in the Lower Rio Grande Valley of Texas; hair sprout of potato in Louisiana, potato and tomato diseases in the Lower Rio Grande Valley of Texas, diseases of tomatoes grown for plants in Georgia, and tomato diseases in Illinois and Indiana greenhouses; diseases reported on onions and related crops (La. and Tex.); bean mosaic, beet leaf spot, diseases of cruciferous crops, carrots, and spinach and aster yellows and other diseases of various crops in Texas; cabbage mosaic in the Carolinas and pea diseases in South Carolina; diseases of cabbage and turnip in Louisiana; celery diseases and downy mildew of cucurbits in Florida; diseases of potato and sweetpotato in storage in Tennessee, by R. A. Hyre; reports on diseases of cereal crops (N. C., S. C., La., and Tex.) and flax diseases in Texas; stem rot on alfalfa and clovers in Tennessee and diseases of Austrian Winter peas in the Carolinas; diseases reported on apples in Pennsylvania in 1943 (tabulated data), brown rot of stone fruits in California, injury to peach trees in West Virginia, condition of nursery stock in Tennessee, water rot and other troubles of orange in California, diseases of strawberry in Louisiana and Mississippi, and strawberry diseases in east Texas; some observations on diseases of woody plants in Florida, including *Clitocybe* root rot of woody plants, by A. S. Rhoads; wood-rotting fungi on living trees; southern fusiform pine rust; additional records of mistletoe (including host records and leaf blight of mistletoe); other phanerogamic parasites on woody plants; notes on the occurrence of *Septobasidium* spp. and other fungi parasitizing insects on woody plants, the "red rust" alga on magnolias, and further notes on lightning injury to trees; greenhouse diseases of ornamental plants in Missouri, by T. W. Bretz; summary of the more important plant diseases taken in connection with the insect and plant disease survey in the general vicinity of ports of entry from June 1943 to December 31, 1943; and brief notes on needle rust on pine in Mississippi and Louisiana and diseases on weeds and miscellaneous plants in Texas.

No. 8.—Low incidence of wheat leaf rust associated with unfavorable late winter weather and antagonism of *Septoria tritici,* by K. S. Chester; cereal diseases in the Carolinas, by R. E. Atkinson; diseases on small grains in Texas, by G. M. Watkins; *Sclerotinia* stem rot of legumes in Tennessee, by R. A. Hyre; alfalfa diseases in Arizona and New Mexico, by W. G. Hoyman; brief reports on leaf spots of oats in Louisiana, alfalfa in Texas, and spotted bur-clover in southwestern Mississippi, diseases of Austrian Winter pea in southwestern Mississippi, *Ascochyta* blight of Austrian Winter peas in Texas, and diseases of vetch in Mississippi; losses in stored potatoes in Maine, by R. C. Cassell; storage diseases of potatoes in Washington and Oregon, by L. W. Boyle; apple storage diseases in New York (with tabulated

data), by L. J. Tyler; storage diseases of apples in Maine and carrots in Washington; borax dip of sweetpotatoes safened by the use of calcium salts in the bedding soils, by R. H. Daines; sweetpotato diseases in Tennessee, by R. A. Hyre; diseases of potato and tomato in Florida, mosaic of potato in Mississippi, potato virus diseases in Louisiana, virus diseases in Ohio war-approved seed potatoes, tomato plant situation in Georgia, damping-off of tomato in Tennessee, and condition of tomatoes in Ohio greenhouses; diseases of vegetable crops grown for seed in Oregon, by L. W. Boyle; conditions affecting the crop situation in Georgia, vegetable seedling diseases in Tennessee, soil deficiency tests in Ohio, cabbage diseases in Tennessee and downy mildew in Georgia, boron deficiency affecting cauliflower in the Florida west coast area, powdery mildew on radishes in Ohio greenhouses, early blight of celery in Florida, downy mildew of cucurbits in Florida, lettuce diseases in Ohio greenhouses, diseases of onions, shallots, and garlic in Louisiana, pea diseases in Georgia and Mississippi and powdery mildew in Louisiana, and *Phytophthora* root rot of spinach in California; citrus root nematode in Florida, by A. L. Taylor; brown rot and rust on stone fruits in California, by H. L. Barnett; brief reports on pear leaf spot in Louisiana and Mississippi and strawberry diseases in Louisiana; diseases of ornamentals in greenhouses in Missouri, by T. W. Bretz; and brief notes on tobacco downy mildew in Georgia and leaf spot on *Aloe* in Florida.

Cornell University abstracts of theses, 1942 (*Ithaca, N. Y.: Cornell Univ. Press, 1943, pp. 358-360, 363-365, 370-372, 378-385, 396-399*).—The following are of interest to plant pathology: A Study of the Pathogenicity of Some *Actinomyces* From the Soil, by P. Decker (pp. 358-360); Purple-Top Wilt of Potatoes [Due to the Aster Yellows Virus], by W. M. Epps (pp. 363-365); The Basal Rot Disease of Lilies [due to *Fusarium oxysporum f. lilii*], by E. P. Imle (pp. 370-372); Inheritance of Loose Smut Reaction in Crosses With Victoria and Smut Resistant (Cornell)–6 [Oats] Under Field Conditions of Growth and Infection, by N. M. Patel (pp. 378-379); Studies on the Late Blight of Potatoes and Its Causal Organism, *Phytophthora infestans* (Mont.) de Bary, by L. C. Peterson (pp. 380-382); Studies of the Bacterial Ring Rot Disease of Potatoes, by J. B. Skaptason (pp. 383-385); and Ozone as a Fungicide, by R. D. Watson (pp. 396-399).

La contribucion de Carlos Spegazzini a la fitopatologia Argentina [The contribution of Carlos Spegazzini to Argentine plant pathology], J. B. Marchionatto (*Univ. Nac. La Plata, Rev. Facult. Agron., 3. ser. 25 (1940), (pub. 1943), pp. 11-20, illus. 1*).—A summary of Spegazzini's work in the fields of botany and mycology.

Notes on Oklahoma Cercosporae, III, W. W. Ray. (Okla. A. and M. Col.) (*Mycologia, 36 (1944), No. 2, pp. 172-176*).—*Cercospora daturicola* n. comb., believed to be the first report for America, and 4 new leaf-infecting species, *Cercospora gomphrenae* on *Gomphrena globosa, C. gonolobi* on *Gonolobus laevis, C. paspali* on *Paspalum stramineum,* and *C. staphyleae* on *Staphylea trifolia* are described in this installment (E. S. R., 88, p. 485). A list of 14 species of *Cercospora* recently collected and placed in the local herbarium is appended.

Photosynthetic activity affected by fungicides and scab, B. L. Richards, Jr. ([N. Y.] Cornell Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10 (1944), No. 2, pp. 7, 9, illus. 1*).—In experiments on apple leaves with bordeaux and several sulfur sprays at 85° F., bordeaux caused less reduction in photosynthesis than did any of the sulfur fungicides, the wettable sulfurs were next in order, whereas lime-sulfur caused the greatest reduction. At 100° the various sulfurs reduced photosynthesis much more than at 70° or 85°. This effect was neg-

ligible when the upper leaf surfaces alone were sprayed. No appreciable visible burning was observed. Under experimental conditions scab infection materially reduced the photosynthesis of leaf tissues, but seldom if ever greater than the percentage area of the leaf covered by scab lesions in the 7 weeks under observation after inoculation. When leaves were sprayed it was definitely proved that rupturing the cuticle by scab infection rendered them much more susceptible to spray injury where a caustic material like lime-sulfur had been used. It is suggested that with proper timing and thoroughness of application, practical scab control may be obtained with some of the milder fungicides, such as wettable sulfurs or sulfur dust, and cumulative benefits may be expected from the greater photosynthetic activity of the foliage.

Effect of soil fertility on returns from use of fungicides, G. L. McNew and C. B. Sayre (*Canner, 98 (1944), No. 16, pp. 16-18, 42, illus. 4*).—In order to gain a better understanding of the complementary action of fertilizer and fungicidal treatments, experiments on seed treatments (Spergon) of peas and on foliage sprays and dusts (copper oxychloride-sulfate) of tomatoes were made (1941-42) on plats receiving different fertilizer treatments, detailed results of which are given. The general finding was that the full value from either fertilizer or fungicide was realized only when they were used together. Even though the relationship of fertilizers to the two types of fungicidal treatment was very similar, the actual use of seed treatment and sprays or dusts must be approached from different angles. Seed treatment is relatively inexpensive and is applied as a kind of insurance before it is known what disease conditions will be encountered; foliage treatment of tomatoes presents an entirely different picture, but fortunately spraying and dusting can be started and stopped according to the development of disease, so the grower has some control over the cost of operation.

Seed treatment of cereals in 1943, W. T. Crosier. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, p. 12*). —Numerous experiments have proved that formaldehyde or New Improved Ceresan will prevent all oats smuts and the latter fungicide barley smuts, but evidence is here presented that even in the absence of smuts, seed treatment may return a profit.

Manganese deficiency in oats, C. S. Piper (*Nature [London], 153 (1944), No. 3876, p. 197*).—A note emphasizing the necessity of adequate chemical control for reliable results in experiments with plants in relation to trace elements.

Bean diseases and their control, L. L. Harter and W. J. Zaumeyer (*U. S. Dept. Agr., Farmers' Bul. 1692, rev. (1944), pp. 29+, illus. 16*).—A slightly revised edition of the publication previously referred to (E. S. R., 68, p. 206).

Bean anthracnose may be checked by new spray, G. L. McNew. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, p. 19*).—Though relatively unimportant in New York for many years, severe local losses from anthracnose have occurred during the past two seasons in some important bean areas of the State. This situation led to tests with the new organic fungicide, Fermate; anthracnose appeared about August 15 and spread uniformly throughout the unsprayed plants, but only rare isolated spots of infection appeared in those which had been sprayed. The results gave much promise, final records indicating that the treatment had effectively reduced the severity of infection and saved about 30 percent of the pods, without evidence of spray injury to the plants or reduction in the yield of pods.

Fungicidal potency of quinoline homologs and derivatives against Phymatotrichum omnivorum, N. E. Rigler and G. A. Greathouse. (Tex. Expt. Sta. and U. S. D. A.). (*Indus. and Engin. Chem., 33 (1941), No. 5, pp. 693-694*;

abs. in Texas Sta. Cir. 103 (1943), pp. 15-16.)—"The fungicidal potencies of a number of quinoline derivatives were determined against *P. omnivorum.* 2,3-Dimethyl-8-ethylquinoline was the most toxic of the 13 quinoline homologs tested, preventing growth at 80 p. p. m. 8-Hydroxyquinoline was the most potent of the compounds tested. It prevented growth at 0.5 p. p. m., while 2-hydroxyquinoline permitted growth at 300 p. p. m."

Studies on Crown and Royal flax in flax-sick soil, I, II, T. C. VANTERPOOL (*Sci. Agr., 24 (1944), No. 6 pp. 259-267, illus. 3; pp. 268-270, illus. 1*).—The following parts are included:

I. *The determination of Crown and Royal seed samples by growth in flax-sick soil.*—Because of its high susceptibility to wilt (*Fusarium lini*), it has been generally recommended that growing of Crown flax be discontinued in Saskatchewan and that it be replaced by the moderately resistant Royal variety. Since the seed of these two varieties cannot be separated visually, a need arose for a method of identifying undetermined seed stocks of these varieties. A comparison was made of the percentages of total plant mortality in 96 such samples grown in flax-sick soil in the greenhouse and in 68 samples both in the greenhouse and in the field, using the University of Saskatchewan strains of the two varieties. In all cases the varietal determinations in the greenhouse and in the field agreed. It is thus suggested that the greenhouse method can be used as a temporary measure to meet this special local situation.

II. *Comparative mortality response of Crown and Royal flax in two different flax-sick soils.*—When the two varieties were grown in the greenhouse in wilt-infested soils from Ottawa (Ontario), and Saskatoon (Saskatchewan), the results showed that Crown was relatively less susceptible to wilt, as expressed in post-emergence percentage mortality, in the Ottawa infested soil (66 percent) than in the Saskatoon infested soil (97 percent); whereas Royal was relatively more susceptible in the Ottawa soil (36 percent) than in the Saskatoon soil (12 percent). These findings in general support the well-known contention that a plant variety resistant to a given disease in one region may not necessarily be as resistant to it in another.

Spore-forming bacteria causing soft rot of potato and retting of flax, L. A. ALLEN (*Nature [London], 153 (1944), No. 3877, pp. 224-225*).—The experiments reported indicate that *Bacillus subtilis* produces enzymes which rot potato tubers and ret flax. Thus, it is noted, the "ability of spore-forming bacteria to cause soft rot of potato, which Dowson [E. S. R., 90, p. 490] recorded for *B. polymyxa,* is certainly not, under laboratory conditions, confined to that species."

Effect of different amounts of spindle tuber and leaf roll on yields of Irish potatoes, E. L. LECLERG, P. M. LOMBARD, A. H. EDDINS, H. T. COOK, and J. C. CAMPBELL. (U. S. D. A. and Ala., Fla., La., Maine, N. J., and Va. Expt. Stas.). (*Amer. Potato Jour., 21 (1944), No. 3, pp. 60-71, illus. 3*).—In experiments to determine the effects of different amounts of the virus spindle tuber and leaf roll diseases on yields of marketable tubers of several potato varieties in seven States (1939-42), the trend was generally to a progressive decrease in the crop as the amount of either malady increased. Commercially speaking, the reduction in yields at 4 and 8 percent of either disease is relatively small. In all comparisons involving more than one variety with 100 percent spindle tuber, no significant difference was evident, but the percentage reduction in yields was significantly greater with both Katahdin and Triumph varieties in Louisiana than it was in Maine (1941-42) and with Irish Cobbler in Maine and Virginia than it was in New Jersey (1940 and 1942). This disease was also more serious with Katahdin in Florida and Maine than in Louisiana. Leaf roll was more serious on Katahdin in Maine than

was spindle tuber, whereas two other diseases were equally detrimental to Irish Cobblers. On the other hand, spindle tuber was more serious on Irish Cobbler in New Jersey and Virginia than was leaf roll. The percentage reduction in yields caused by 100 percent leaf roll was markedly greater than that resulting from 100 percent spindle tuber for Katahdin in Florida, Louisiana, and Maine (1940-42).

Aphis rhamni Boyer: Its occurrence in Ireland and its efficiency as a vector of potato viruses, J. B. Loughnane ([*Ireland*] *Eire Dept. Agr. Jour., 40 (1943), No. 2, pp. 291-298*).—It is concluded on experimental bases that *A. rhamni* can act as a vector of potato viruses, and there was also some indication that it is a more efficient vector of virus Y than of leaf roll virus. Results suggested that starvation followed by a short feeding period on the source of infection does not increase its effectiveness as a vector. In the single test where compared, *A. rhamni* was not as efficient a carrier of leaf roll as the green peach aphid. How far the former may go in spreading potato viruses in the field is not known, but there are certain factors which would tend to minimize its importance there. Thus, old plants are more difficult to infect than young vigorously growing ones; *A. rhamni* does not thrive in Ireland until late in July, when the plants have reached maximum size and are no longer making new foliage. Furthermore, it tends to remain in colonies on the leaf on which it was produced, moving to new leaves only when overcrowded. Such considerations lead to the belief that this aphid is not important as a potato virus vector in the field. This view is also supported by the fact that in districts where it occurs abundantly seed potatoes have been grown for many years without noticeable increase in the incidence of virus diseases in the crops.

Epifitologia del "tizon" de la papa en la zona papera "sudeste" de la Provincia de Buenos Aires durante el verano 1940-41 [Epidemiology of late blight in the potato region southeast of the Province of Buenos Aires during the summer of 1940-41], E. F. Godoy (*Univ. Nac. La Plata, Rev. Facult. Agron., 3. ser., 25 (1940), (pub. 1943), pp. 97-140, illus. 7; Eng. abs. pp. 135-137*).—It was established that, beginning with the coastal areas, this late blight (*Phytophthora infestans*) epidemic spread over the whole potato region. It was believed to have originated from use of infected seed tubers and was the severest ever experienced in this part of Argentina. The attacks appeared at brief intervals from December 1940 through February 1941 under climatic conditions favoring infection. Records of the blight development in relation to relative humidity and temperature were similar to those of various investigators in other countries. During the past 33 yr. four authentic and two unproved reports of blight were received from this region; in 1914-15 it was epidemic in proportions, but the other cases were in isolated fields. During December-March over the 33-yr. period, the rainfall and humidity of the blight years were above and the temperature below the normals for this region. The varieties Katahdin, Green Mountain, and White Rose were similar in tuber susceptibility, whereas the susceptibility of their foliage increased in the order named. The foliage of the European Alma and Arran Consul potatoes was less susceptible than that of the above American varieties. Among the latter, Katahdin and Green Mountain yielded best, possibly because of their earliness. In the 1940-41 epidemic it is estimated that 60-70 percent of the expected crop was lost on account of late blight. The results of bordeaux spray tests appeared to indicate the difficulty if not impossibility of controlling an epidemic of the character and severity of the one reported upon.

A roguing service for producers of foundation seed potatoes, G. W. Simpson and W. F. Porter (*Maine Sta. Misc. Pub. 584 (1944), pp. 21+*).—The

need for reliable sources of foundation seed potatoes remains an annually recurring problem; with the shortage of competent roguers to add to labor difficulties, seed that will pass certification without roguing is of great help to every producer. The station foundation seed program started in 1939 has never produced more than 25 percent of the seed needed, but the 5 yr. of its operation have proved that seed sources could be maintained by growers within the State. The station here presents suggestions for the handling by growers of foundation seed plats which are entered in the program, including isolation requirements, planting of more than one variety, care of land, control of weeds, planting, seed sources and treatment, roguing, early harvesting, limitation on acreage, Florida test sample, and disease tolerance. The financial arrangements for the roguing service are detailed. Special information is also presented on avoiding contamination with ring rot, by R. Bonde, and on the use of chemicals for the elimination of rose, buckthorn, plum, and other aphid hosts, by G. P. Steinbauer and F. H. Steinmetz.

Recent tests of materials for potato spraying in Pennsylvania, H. W. Thurston, Jr. (Pa. Expt. Sta.). (*Amer. Potato Jour., 21 (1944), No. 3, pp. 55-59*).—During the past 3 yr. about 20 materials were tested in field experiments under conditions of commercial culture and application. During this period the use of yellow cuprocide and tribasic copper sulfate has resulted in yields not significantly lower than bordeaux of comparable Cu content. Decreasing the amount of Cu to "stretch" the supply of this strategic material has been tried, but during severe epidemics of late blight reduced formulas have failed to give satisfactory control. Addition of contact insecticides (e.g., derris or nicotine sulfate) affects insect populations, especially aphids, but often it has at the same time depressed the yields and is believed to be poor economy. That several other fixed coppers can be expected to equal the two above noted is indicated by the performance of copper "A" compound, and the promise of new organic fungicides for the future appears to be upheld by the results with HE 175 (disodium ethylene dithiocarbamate). Choice must inevitably be made among an ever increasing group of useful fungicides; at present it seems equally true that as yet there is nothing better than bordeaux.

Blind seed disease of rye-grass, E. L. Calvert and A. E. Muskett (*Nature [London], 153 (1944), No. 3879, pp. 287-288*).—Inoculations with *Phialea temulata* (ascospores and macrospores) gave heavy infections of ryegrass at flowering time, but when they were made after fertilization the amount of infection rapidly declined. Other hosts are listed. Treatments with seed disinfectants, including organic mercury compounds, were not altogether satisfactory, but use of hot water for 15 min. at 50° C. following preimmersion for 4 hr. in tepid water, or for 30 min. at 50° without preimmersion, gave full control with little or no reduction in germinability when the seed was dried immediately afterward. The evidence, however, indicates that seed treatment cannot be expected to provide satisfactory control in the field where infected plant species are nearby. The damage from this disease appears to be confined to the seed, with the subsequent reduction in germination.

Control of flue-cured tobacco root diseases by crop rotation, E. E. Clayton, J. G. Gaines, T. E. Smith, K. J. Shaw, and T. W. Graham. (Coop. Ga. Coastal Plain, N. C., and S. C. Expt. Stas. et al.). (*U. S. Dept. Agr. Farmers' Bul. 1952 (1944), pp. 12+, illus. 8*).—Soil-borne parasites (root knot, bacteria, fungi) are serious hazards for growers of flue-cured tobacco. These troubles can be identified by observing the general appearance of an affected field and then examining individual plants. Based on information available on the

disease-control value of common crops that can be grown in the Southeast between crops of tobacco, intelligent rotation is found to be of immediate and practical benefit in reducing disease losses. Disease identification and suggested rotations are discussed.

The value of different seed treatments for lima beans, G. L. McNew (*Canner, 98 (1944), No. 17, pp. 16, 18, 24, 26, illus. 3*).—Results of the tests here reported, as well as those by others, are said to leave little doubt as to the need of seed treatment for lima beans and the value of certain fungicides in preventing failures. In the past few years three new and safe fungicides—Fermate, Thiosan, and Spergon—have been developed for this crop.

Downy mildew disease of cauliflower seed plants, W. Jones (*Sci. Agr., 24 (1944), No. 6, pp. 282-284, illus. 1*).—Infection of cauliflower by *Peronospora brassicae* has usually not been considered of much economic importance, but recently this disease caused considerable damage to plants grown for seed and inoculations confirmed the field observations as to the cause. Under the prevailing environal conditions the fungus seems to have a drying effect on the tissues of the curd. It was noted that affected tissues remained moist after spraying with water, whereas water would not adhere to the curd of normal plants. Insects such as flea beetles, thrips, and aphids are usually present on seed plants in the field; these undoubtedly facilitate entry of the fungus and may also act as spore carriers.

Sweet corn tests, 1943 (*New Jersey Stas. Plant Disease Notes, 21 (1943), No. 7, pp. 25-28*).—Further variety and hybrid comparisons (E. S. R., 88, p. 490) are discussed and tabulated with regard to their relative reactions to bacterial wilt and ear smut.

Anguillulina dipsaci in the inflorescence of onions and in the samples of onion seed, T. Goodey (*Jour. Helminthol., 21 (1943), No. 1, pp. 22-30, illus. 1*).—Though the causal relation of the stem nematode to onion bloat has been known for a long time, certain gaps in its bionomics have remained, particularly its sporadic incidence in areas where onions have not been grown for many years. Observations and experimental studies here reported establish the fact that at the time the seeds are setting the parasite may occur in large numbers in various parts of the flower and within the flower stalk. As these parts gradually dry out, large numbers of the parasite in the infective stage coil up in and on the drying tissue; much of this forms small dry fragments accompanying the seed as it falls from the capsules and the seed may thus carry the pest. *A. dipsaci* was also found on various commercial samples of onion seed examined and reported upon in detail. An additional note refers to a test by E. R. Wallace, in which four varieties of onions were sown in three replications. Examination of the resulting crop showed a number of nematode-infested bulbs in one of the varieties, one or two in another, and none at all in the remaining two varieties. Seed of the first lot left over were sent to the author, who found considerable numbers of the parasite thereon. Infection of the bulbs had thus undoubtedly been from the seed rather than from the soil.

Stem eelworm in onion bulbs, probably seed-borne in origin, E. R. Wallace and J. Wood (*Jour. Helminthol., 21 (1943), No. 1, pp. 33-36*).—The results of a small experiment reported in detail, including the findings of T. Goodey from seed sent him by the authors, and observations in commercial fields lead the authors to believe that the stem nematode may be carried by the seed.

Pea root-rot fungi survive despite crop rotations, O. A. Reinking. (N. Y. State Expt. Sta.). (*Farm. Res. [New York State and Cornell Stas.],*

10 (1944), No. 2, pp. 3, 15, 17, illus. 1).—In a greenhouse test with soil from rotation experiments on the station farm begun in 1940, the counts on severity of disease made after the 1943 season showed that the plat planted continuously for 3 yr. to peas was severely infected with root rot due to *Fusarium solani martii* and *Aphanomyces euteiches,* that the two plats planted to other crops in rotation developed 10 percent less disease, and that the fallow plat had 20 percent less. Though the severity of disease in a greenhouse test may not give a true picture of what might happen in the field, it does indicate that root rot organisms are a threat to pea production and may cause severe losses in a 4-yr. rotation. All studies thus far made suggest that peas should be planted early and only on selected properly prepared sufficiently fertilized well-drained soils not previously in peas for many years.

Spraying experiments for control of tomato anthracnose (*New Jersey Stas. Plant Disease Notes, 21 (1943), No. 9, pp. 33-36*).—In the 1943 syray tests, both Fermate and tribasic copper sulfate gave significant reductions in the percentage of fruits with anthracnose. It is believed that a practical spray program can be developed that will control both foliage and fruit diseases of the tomato.

The prevention of tomato leaf blight, G. L. McNew (*Canner, 98 (1944), No. 21, pp. 14-16, 18, 26, illus. 3*).—This is a summary presentation of the present status of prevention of tomato defoliation caused by different fungi, as based on the latest research. Data are given on reductions in yield and quality by leaf blights, production of disease-free plants, rotation of crops, and use of insecticidal and fungicidal sprays. A complete leaf-blight control program is briefly outlined.

Boron deficiency and the ascorbic-acid content of tomatoes, C. B. Lyon and R. Q. Parks. (U. S. D. A.). (*Bot. Gaz., 105 (1944), No. 3, pp. 392-393*).—In this one of a series of studies (E. S. R., 88, p. 560; 89, p. 668) on the effects of mineral nutrition on the ascorbic acid content of tomatoes, it was found that lack of B resulted in less growth and fruitfulness, accompanied by severe deficiency symptoms with less B in vegetable parts of the plant, but failed to affect significantly the ascorbic acid content of the fruits.

Walnut wilt of tomato, M. C. Strong (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 194-195, illus. 1*).—The author calls attention to the nonparasitic wilting of tomato plants adjacent to black walnut trees, stating that 50 percent of the cases of wilt reported in 1943, particularly in gardens, were of this type of trouble. Various plants resistant or susceptible to the toxic principle, juglone, in the roots are noted. Cutting back the trees fails to remedy the trouble, since the toxic effect disappears only when all roots have decayed and disintegrated.

Control of water-core of turnips by spraying with borax, J. D. MacLachlan (*Sci. Agr., 24 (1944), No. 7, pp. 327-331*).—The results of an extensive series of small-plat tests showed that spraying the upper surfaces of the leaves of turnips with a borax solution supplies sufficient B to give practical control of water core, the cost of materials being less than $1 per acre. Any type of sprayer can be used so long as a uniform coverage of the upper surfaces of the leaves is obtained. The first application should be made when the roots are 1-1.5 in. but not more than 2 in. in diameter; this one spray is sufficient to prevent a mild to moderate occurrence of water core but not always enough for a severe attack. Since it is impossible to predict the relative severity, it is suggested that 1 or 2 check blocks be left in each area of turnips, preferably on or over the face of a knoll or where the trouble is most likely to be severe; if no water core has developed there after the first spray, the chances are that a second treat-

ment will be unnecessary. Directions for making up the spray are given.

Mottle leaf or mosaic chlorosis of apples, A. J. Louw (*Farming in So. Africa, 19 (1944), No. 214, pp. 32-34, 44, illus. 1*).—This disease, prevalent in South Africa for many years, was found to be virus-induced and transmissible by budding or grafting but apparently not by pruning. All commercial varieties grown there seem to be subject, in Golden Delicious orchards the percentage of infection always being high. Indications are that the disease is harmful to both growth and yields. Propagation only from mosaic-free trees is advised.

Sour-cherry leaf-spot control in Oregon, S. M. Zeller, C. E. Owens, and A. W. Evans (*Oregon Sta. Tech. Bul. 4 (1944), pp. 12, illus. 2*).—Since it has been demonstrated that control measures against *Higginsia hiemalis* infection which are effective in one season or region may not be so under other conditions or in other regions, it seemed desirable to evaluate for Oregon the effectiveness and safety of various copper, sulfur, and other spray materials and dusts for leaf spot control as based on 3 yr. of experimental results. The leaf spot problem of the State, the causal fungus in relation to control, and the experimental work are discussed (with tabulated data), and detailed control recommendations are presented for western Oregon.

Observations on the history and status of the avocado tree decline and collapse problem in California, R. W. Hodgson. (Univ. Calif.). (*Calif. Avocado Soc. Yearbook, 1943, pp. 27-29, illus. 1*).—"Summing up the facts available, it is certain that avocado tree decline and collapse of the type now so widespread in certain localities in California do not comprise a new and mysterious disease which is likely to become general throughout the industry. On the other hand, it is clear that these troubles are associated with soil conditions and that excess moisture comprises the primary unfavorable factor under which they develop."

The possible relationships of soil organisms to avocado tree decline and collapse, L. J. Klotz and V. P. Sokoloff. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Soc. Yearbook, 1943, pp. 30-33, illus. 1*).—Experimental evidence is presented in support of the theory that nitrates and H_2S or accompanying toxic materials are important in root injury of avocados, especially under water-logged conditions. If present in sufficient concentration they kill the feeder roots of avocado and citrus, even in the absence of *Phytophthora*. If the concentration is not high enough to kill but in varying degrees only to injure these feeder roots, the fungi can and do successfully parasitize and finally kill them. The third but probably minor factor is that the fungus itself can reduce nitrates to nitrites. The evidence thus far indicates that the effects of adverse soil factors—nitrites, H_2S, etc.—precede any extensive parasitism by the fungus. It has been demonstrated experimentally that it is possible to infect the small roots, but if the trees are grown under good conditions, the rate of root production greatly exceeds that at which the roots are killed by the fungi and the trees continue in apparently good health. If, however, poor conditions permit the fungi to kill at a rate exceeding production, decline or collapse may follow. Roots of citrus and possibly also of avocado are more resistant to attack by *Phytophthora* spp. than is the trunk.

The drainage and permeability characteristics of the soils on which avocado tree decline and collapse are prevalent, M. R. Huberty. (Univ. Calif.). (*Calif. Avocado Soc. Yearbook, 1943, pp. 38-39*).—Avocado orchards have generally been planted on hill soils which have been formed in place from the rock immediate below, or on weathered secondary soils having dense subsoils. Field

and laboratory measurements show the surface soil to be normally very much more permeable to water than the subsoil. This condition causes free water to collect immediately above the dense subsoil following heavy rainfall or large applications of irrigation water. Surface drains and subdrains, or both, can be used in reducing excessive moisture in soils of reasonable depth. It should be recognized that soils of the Merriam and Los Flores types are problem soils and not suited to general avocado culture."

Relationship of soil moisture and drainage conditions to tree decline in avocado orchards, E. R. Parker and M. B. Rounds. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Soc. Yearbook, 1943, pp. 34-37*).—This is a preliminary report of studies indicating definite correlations between soil conditions as affecting the accumulation of free water in the soil and the occurrence of avocado tree decline, the situation in one orchard being briefly described as an illustration. Surface drainage toward orchards from adjacent lands, free water in soil near the tops of hills with shallow surface soil overlying a clay subsoil, and planting in deep tree holes blasted out into the clay subsoil also proved detrimental. On the other hand, facilitating the prompt removal of surface water during periods of heavy rainfall was apparently beneficial.

Boron content of avocado trees and soils, A. R. C. Haas. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Soc. Yearbook, 1943, pp. 41-52, illus. 5*).—Avocado seedling growth in culture solution was seriously interfered with when B was inadequately supplied, and the amount in the leaves was greatly reduced when severe symptoms were evident. Injury to the meristem or growing point of the terminal growth was one of the first signs of B-hunger. Additional symptoms were the corking and splitting of veins and trunk, burning and distorting of the new leaves, and swelling of young twigs with a brown staining of the wood. The young roots disintegrated as the tree died back from the tips. The water-soluble and insoluble portions of the B content of the leaves and of fruit pulp and skin of orchard trees of different varieties in the same soil were studied, and the possible relationship of B to blossom (tip) end cracking of certain fruits is referred to. The possibility that some avocado orchard soils might be deficient in available B was also explored, but no evidence of this condition has thus far been found.

The diagnosis of swollen-shoot disease of cacao, A. F. Posnette (*Trop. Agr. [Trinidad], 21 (1944), No. 3, pp. 56-58*).—Covered from another source (E. S. R., 90, p. 652).

Brown rot and gummosis, L. J. Klotz. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 2, pp. 6-7, illus. 3*).—Due largely to the wet winters and lack of proper spray protection, brown rot of the fruits and crown and trunk gummosis of the trees have been causing unusually great damage throughout the citrus area of southern and central California since 1938. The standard methods of control are summarized, and mention is made of the new compound, tetrachloroquinone, which, used at the rate of 1 lb. to 100 gal., has given good protection against brown rot both in the grove and in the laboratory on detached fruits.

Omphalia root rot of the date palm, D. E. Bliss. (Calif. Citrus Expt. Sta.). (*Hilgardia [California Sta.], 16 (1944), No. 2, pp. 15-124, illus. 49*).—The importance of decline disease to the date industry lies principally in the fact that infected areas are increasing both in size and number. Since certain growers are urging control through regulation of planting stock, it seemed desirable to publish a comprehensive report on the 15-yr. investigation of this disease—

apparently unknown before 1921. Its history is reviewed and the symptoms are fully described and illustrated.

Micro-organisms of wide variety from the roots and trunks of diseased date palms were tested, two fungus types later described as *O. pigmentata* and *O. tralucida* predominating, constantly associated with the disease, and shown by repeated inoculations to be the causal agents. The date palm is the only host known to be spontaneously infected, but the susceptibility of *Washingtonia filifera* and *Phoenix canariensis* was demonstrated by artificial inoculations. The fungi were found to enter the palm by direct mycelial penetration through the cuticle and outer epidermal wall; the host-parasite relations and development of the disease and factors influencing it are discussed in detail. Whereas the reactions of Deglet Noor palms to the pathogens may include severe stunting in addition to root necrosis, the reactions of palms of other varieties may include only a slight amount of such necrosis. Because of the lag between the appearance of primary and secondary symptoms, infected but healthy-appearing palms commonly occur at the margin of an enlarging diseased area; the survey method of diagnosis is therefore less accurate than the laboratory method. The means by which *Omphalia* spreads in the orchard from tree to tree has not yet been discovered. New foci of disease are usually created by transplanting offshoots from diseased palms; it follows that the occurrence of this root rot may be prevented by using only healthy offshoots in noninfested soil. There is evidence that the varieties Khadrawy, Halawy, Iteema, Tazizaoot, Khustawy, Zahidi, and Tafazwin and many seedlings possess considerable tolerance to the disease; relative resistance of seedlings also increases with age. Among soil treatments of potted seedlings with 17 chemicals—nitrates, hydroxides, sulfates, and phosphates of K, H, NH_4, and Ca—the first named gave the most effective control and the last group the least, even seeming to increase the severity of attack. The health of many slightly infected palms in one test was improved by heavy applications of water and fertilizer; there was no practical evidence of recovery of very sick trees. Carbon disulfide, chloropicrin, and ethylene oxide gave the most encouraging results in preliminary experiments on soil disinfection; in the field the first was judged most satisfactory. There are 52 references.

Stylar end checking of the Hachiya persimmon, P. A. Miller. (Univ. Calif.). (*Calif. Avocado Soc. Yearbook, 1943, pp. 53-55, illus. 1*).—This fruit blemish of Hachiya persimmons is compared to "blacknose" of dates, both of which are said to be of physiological origin. On the basis of observations and experiments the injury is attributed to the presence of free moisture on the surface of fruits prior to harvest. The reason that this type of injury is more common in the humid coastal areas than in the dry interior is thus obvious.

Diseases of the rose in Arizona (*Arizona Sta. Bul. 190 (1943), pp. 25+, illus. 6*).—This handbook considers the rose diseases of major importance in the State and those needing further investigation, diseases rare or not known to occur in Arizona, foliage defects, blossom blights, and miscellaneous causes of failure with roses. A key for identifying the rose diseases of the State is included.

Tulip bulbs attacked by Anguillulina dipsaci, T. Goodey, (*Jour. Helminthol., 21 (1943), No. 1, pp. 30-32*).—A brief discussion of the litterature of nematode attacks on tulip bulbs and report of a case of extreme damage in a commercial field in England (1943), where thousands of bulbs had to be destroyed. It is noted that the records of *A. dipsaci* on tulips are not limited to one or two varieties but include varieties belonging to different groups.

Spermatial formation in Gymnosporangium clavipes, L. S. Olive

(*Mycologia, 36 (1944), No. 2, pp. 211-214, illus. 2*).—Diseased fruits of *Amelanchier* showing fresh spermagonia over their surfaces were used in this cytological study of the development of spermatia from the spermatial hyphae. It is noted that the method of spermatial formation in *G. clavipes* is like that found by a number of investigators in various *Ascomycetes*. Suggestions for further study in both groups of fungi are made.

Boxwood blights and Hyponectria buxi, B. O. Dodge. (*Mycologia, 36 (1944), No. 2, pp. 215-222, illus. 2*).—This is a critical discussion of the taxonomy and relationships of the boxwood leaf blight or dieback due to *Nectriella rousseliana* and another similar blight on specimens recently sent in from Long Island, N. Y., the cause of which was identified as *H. buxi,* both of which have similar conidial stages. It is felt that this confusion in regard to boxwood leaf blight and dieback cannot be fully clarified until culture studies of both the *Nectriella* and the *Hyponectria* are made, starting in each case with single ascospores. Such studies followed by infection tests will enable a determination of the status of *Volutella buxi* and *Verticillium buxi* which have previously been considered as conidial stages of one and the same fungus, viz, *N. rousseliana.*

Ribes eradication effectively controls white pine blister rust, J. F. Martin. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 4, pp. 255-260, illus. 1*).—*Cronartium ribicola* is spread by wind-borne spores from pine to *Ribes* for distances up to 300 miles or more and from *Ribes* to pine usually not over 900 ft. but occasionally a mile or more. Practical control of the disease has been under way in the Northeastern States since 1918, but in other white pine areas of the United States for shorter periods. It is controlled in white pine forest areas by reducing the *Ribes* to an average of 25 ft. or less of live stem per acre, accomplished by one or more workings and maintained by periodic inspection where conditions justify it. Studies in different white pine regions indicated that infection had been checked on protected areas following *Ribes* eradication, whereas on unprotected areas the cankers continued to appear each year in large numbers. An important result of such eradication is the fact that it permits protected areas to restock spontaneously with white pine seedlings that otherwise would be killed by rust. Pine stands of esthetic or recreational value and forest nurseries require more thorough *Ribes* eradication than is given to forest lands. Where conditions justify the higher cost, *Ribes* can be eliminated by periodic reworkings.

A refinement of Gemmell's single cyst technique, D. W. Fenwick (*Jour. Helminthol., 21 (1943), No. 1, pp. 37-41, illus. 1*).—A modification is presented of the technic developed by A. R. Gemmell in studies of *Heterodera schachtii* and here used in studying *H. rostochiensis.*

Note on the use of picric acid as a hatching agent, D. W. Fenwick (*Jour. Helminthol., 21 (1943), No. 1, pp. 41-42*).—Dilute picric acid caused active hatching of nematode cysts, this influence being strongest at 0.02–0.01 percent concentration in distilled water. In late fall and winter, when root action is slight, picric acid has proved a more reliable hatching agent than root excretion unless precautions are taken to insure that the plants yielding the excretion are in an active vigorous growing state.

A note on the feeding of the nematode Anguillulina macrura, T. Goodey (*Jour. Helminthol., 21 (1943), No. 1, pp. 17-19, illus. 1*).—On two occasions specimens of this nematode were found attached to the roots of oats and ryegrass, respectively. Microscope sections of one of the latter individuals showed it to have entered the root by penetrating below an epidermal cell bearing a root hair, the esophageal region lying outstretched about one cell deep beneath the epidermis.

Brief reference is made to other species attacking roots of members of the grass family.

Three Hyphomycetes that capture nematodes in adhesive networks, C. DRECHSLER. (U. S. D. A.). (*Mycologia, 36 (1944), No. 2, pp. 138-171, illus. 5*).—In several previous papers (e. g., E. S. R., 89, p. 551), descriptive treatment has been given to 22 interrelated hyphomycetous fungi subsisting by capture and destruction of nematodes infesting transparent agar plate cultures started from diseased rootlets or other decaying plant materials; similar treatment is here given to 3 additional fungi of like habits, viz, *Arthrobotrys cladodes macroides* n. var., capturing nematodes up to 600μ long and of several species and occurring in decaying roots of *Viola tricolor* and in leaf mold in Maryland; *A. arthrobotryoides,* found destroying nematodes in agar plate cultures; and *Dactylaria psychrophila* n. sp., capturing and consuming nematodes about 150–600μ long and of several species and occurring on decaying leaves and stems of potato in Maine.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The war and the future of entomology, P. N. ANNAND. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 1-9*).—An address reviewing the effects of the war on research, regulatory entomology, public-supported control programs, and on the training of entomologists; the increase in public knowledge and appreciation of entomology during the war; stimulation of international considerations by the war; and post-war entomology. "The conclusion that the problems in entomology will not be lessened after the war, but will be increasingly complicated and will assume greater international importance, would appear justified by the facts now available to us."

White-footed mice feeding upon grasshopper eggs, H. S. TELFORD. (N. Dak. Agr. Col.). (*Jour. Mammal., 24 (1943), No. 3, pp. 400-401; also in North Dakota Sta. Bimo. Bul., 6 (1944), No. 4, p. 18*).—*Peromyscus maniculatus osgoodi,* common in western North Dakota, was found seeking out and feeding on egg pods of the differential grasshopper. Although these mice are primarily vegetarians, they also feed on insects; there is apparently no previous record, however, of their feeding on grasshopper egg pods.

Winter quail foods on abandoned farm lands in the Norris Reservoir area, E. R. CADY (*Jour. Tenn. Acad. Sci., 19 (1944), No. 1, pp. 10-15*).—This inquiry is concerned chiefly with the effects of abandonment of farm lands on the food of quail and the widespread introduction of lespedeza on their feeding habits in this eastern Tennessee area. Among the 82 genera of food plants and several unidentified forms found in the crops of birds shot by hunters during the three open seasons under study, 2 species, lespedeza and ragweed, comprised over 76 percent of the bobwhite quail food during the winter months and 10 species supplied over 93 percent. The choice of food definitely changed as farm land reverted to the wild state, but on both types of land the exotic plant, lespedeza, has become the chief winter food of quail. Lespedeza seeds tend to remain on the plants through the winter to a greater extent than ragweed seeds; this possibly explains its increased use later in the winter.

Habits of our toads, H. S. TELFORD (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 4, pp. 33-35*).—The abundance of toads in North Dakota during the past 3 yr. of abundant rainfall is noted. Though four species may occur in the State, the great plains toad *Bufo cognatus* is by far the most abundant. From the brief review presented of its breeding habits, it is readily seen that because of its ability

to remain inactive in its burrows, thus withstanding drought, together with its faculty to range considerable distances from breeding grounds and its propensity for seeking out and devouring injurious insects, it is indeed a friend of the farmer and gardener.

Toads feed upon sweet clover weevils, H. S. TELFORD and J. A. MUNRO (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 4, pp. 35-37*).—According to stomach analyses of 74 great plains toads during midsummer (1943), the majority of insects devoured were sweetclover weevils—*Sitona cylindricollis* (F.)—which were most abundant the latter part of July. By August 7 about 90 percent of them had disappeared, possibly as a result of the activities of the heavy toad population. Over 15 percent of the total number of insects taken were ants; the field cricket, larval and adult carabids or ground beetles, a few adult wireworms, and miscellaneous insects were also occasionally found. The reason so few cutworms were taken was probably because of their appearance in early spring, before the time of these studies.

Arthropod collecting in the burrows of a Texas pocket-gopher, E. S. Ross (*Ent. News, 55 (1944), No. 3, pp. 57-61*).—Preliminary lists of predominant inhabitants of the nest and refuse chambers, respectively, are included. It is noted that the presence of hibernating chinch bugs may have economic significance, and the discovery of large Tenebrionidae and adults in these and other animal burrows in arid regions suggests that burrows may be the normal breeding places or refuges of such insects.

[Notes on insects and insecticides] (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 103-124, illus. 6*).—Contributions presented (E. S. R., 90, p. 797) are Methyl Bromide Fumigation for the Delousing of Troops, by R. Latta (p. 103), Particle Size of Commercial Calcium Arsenates by Air-Permeation Tests, by E. L. Gooden (pp. 104-105), The Toxicity of Cyclopropyl Alkyl Ethers and Trichloromethanesulfonyl Chloride to the Confused Flour Beetle, by H. H. Richardson, M. S. Schechter, and H. L. Haller (pp. 111-112), Anethole and Pimenta Leaf Oil as Attractants for the Japanese Beetle, by W. E. Fleming and R. D. Chisholm (p. 116), Toxicity of Nitroparaffins and Chloronated Nitroparaffins to California Red Scale and Their Effect on Lemon Fruits, by R. A. Fulton, R. L. Busbey, and H. R. Yust (p. 117), and Husk Characters of Field Corn in Relation to Feeding by Birds on [Corn] Earworms, by F. F. Dicke and G. W. Barber (pp. 119-120) (all U. S. D. A.); *Anthocomus bipunctatus* (Harrer), a New Household Insect, by G. T. French (p. 103); Observations on *Prospaltella perniciosi* [Tower] and Its Mass Production, by S. E. Flanders (p. 105), Laboratory Tests on the Oriental Fruit Moth With Special Reference to DDT, by G. E. Carman and C. A. Fleschner (pp. 122-123), and Results With Dichloro-Diphenyl-Trichloroethane in Control of the California Red Scale, by D. L. Lindgren and A. M. Boyce (pp. 123-124) (all Calif. Citrus Expt. Sta.); Sprays of 2,4-Dinitro-6-Cyclohexylphenol for Control of the White Apple Leafhopper, by J. A. Cox (p. 106) (Va. Sta.); Distribution of *Culpex pipiens* [L.] in the Southeastern United States, by J. F. Wanamaker, R. W. Chamberlain, and S. J. Carpenter (pp. 106-107); Inland Records of Salt Marsh Mosquitoes [*Anopheles atropos* (D. & K.), *Aedes sollicitans* (Walk.), *A. taeniorhynchus* (Wied.)], by S. J. Carpenter and W. W. Middlekauf (p. 108); Additional Mosquito Records for the Southeastern States, by G. H. Bradley, R. F. Fritz, and L. E. Perry (p. 109); A Preliminary List of the Mosquitoes of Indiana, by G. R. Christensen and F. C. Harmston (pp. 110-111); Armyworms in Georgia, by T. L. Bissell (pp. 112-113) (Ga. Sta.); A Slide Rule for Estimating Schedules for Fumigating With Methyl Bromide, by L. L. English (pp. 114-115) (Ala. Sta.); The Biology of *Triatoma neotomae* Neiva

in Texas, by D. C. Thurman, Jr. (pp. 116-117); The Use of D-D Mixture Against *Anomala* and *Adoretus* Infesting Nursery Stock, by W. Carter (pp. 117-118) (Pineapple Res. Inst. Hawaii); Pentatomidae Eaten by Utah Birds, by G. F. Knowlton (pp. 118-119), and Snipe Flies [*Symphoromyia hirta* Johnson] in Utah, by G. F. Knowlton and D. R. Maddock (p. 119) (both Utah Sta.); and Performance of Dichlorodiphenyl Trichloroethane (DDT) Used Against the Oriental Fruit Moth, by B. F. Driggers (pp. 120-121), and Toxicity of DDT to *Blattella germanica,* as Compared With Sodium Fluoride, Derris, and Pyrethrum, by J. M. Ginsburg (p. 122) (both N. J. Stas.).

Sources of variations in the effectiveness of derris dusts, J. M. Hutzel and N. F. Howard. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 65-69*).—Derris-dust mixtures prepared from different samples of roots and containing equivalent rotenone concentrations are subject to marked variations in effectiveness when applied in the laboratory against Mexican bean beetle larvae. In tests to determine the source of these variations, it was found that their effectiveness depends on both the chemical and the physical properties of the ground root, varying inversely as the particle size and directly both as the number of toxicant particles per unit of mixed dust and as the rotenone content with any two of these variables constant. Impregnated or coated dusts of similar particle size varied directly in effectiveness as the number of toxicant (coated) particles per unit of mixed dust. The physical properties were interpreted as influencing the rate and amount of toxicant absorption by determining the surface area of the toxicant coming into contact with the absorbing surfaces of the insect. The preparation of derris-dust mixtures apparently should include some compensation for the differences in number of toxicant particles per unit of mixed dust as influenced by particle size and proportion of ground root, instead of being prepared entirely according to the active chemical constituents.

Addition of extractives of rotenone-bearing plants to spray oils, W. Ebeling, F. A. Gunther, J. P. LaDue, and J. J. Ortega. (Calif. Citrus Expt. Sta.). (*Hilgardia [California Sta.], 15 (1944), No. 7, pp. 675-701, illus. 2*).—Ground roots and ether extractives of the ground roots were dissolved directly in spray oil by stirring for 20 min. at 25° C. The extractives were also added to the oil via mutual solvents consisting of (1) solubilizers—resulting in solutions in oil of derris extractives largely in a colloidal state—and (2) oleotropic solvents—relatively inefficient but resulting in true solutions of the extractives in oil. The latter type was the more effective against the California red scale on citrus trees. Rotenone and rotenone-free extractives derived from derris root appeared about equally effective when used in oil against the red scale and seemed to act synergistically when used together. Among the oil toxicants, the less volatile solutions had a more prolonged residual effect than volatile oils such as kerosene, but if the latter were sufficiently effective they might result in a higher degree of red scale control, even as long as 9 mo. afterward, than the less volatile but also less toxic oils.

Laboratory tests of synthetic organic compounds as insecticides, M. C. Swingle, J. B. Gahan, and E. L. Mayer. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 70-74*).—The possible effectiveness of 82 synthetic organic compounds was tested and the results are briefly discussed. Each was tried against 5–9 of the 16 different species of insects used in the study, 11 proving moderately toxic to the species on which they were used. The most effective compound was 2-chloro-6-nitrotoluene—a volatile material which was also effective as a fumigant. None of the materials appeared useful as practical insecticides.

Tests conducted by the Bureau of Entomology and Plant Quarantine to ap-

praise the usefulness of DDT as an insecticide, P. N. ANNAND ET AL. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 125-159, illus. 1*).—In an effort to find new insecticides for the protection of man and animals from attack by annoying and disease-bearing insects and to control species which destroy food and fiber, this bureau, according to the introductory discussion by Annand, is testing many materials, comprising those developed as a result of research by the bureau as well as some obtained from other sources, including those supplied by industry. One of the proprietary compounds tested during recent months is a synthetic organic chemical known as "DDT." The following articles report some of the experimental studies with DDT, largely as an agricultural insecticide, that have been carried out by employees of the bureau during the short time that the material has been under experimentation: DDT for the Control of Human Lice, by R. C. Bushland, L. C. McAlister, Jr., G. W. Eddy, and H. A. Jones (pp. 126-127); DDT as a Residual Spray for the Control of Bedbugs, by A. H. Madden, A. W. Lindquist, and E. F. Knipling (pp. 127-128); Mortality of Bedbugs on Rabbits Given Oral Dosages of DDT and Pyrethrum, by A. W. Lindquist, E. F. Knipling, H. A. Jones, and A. H. Madden (p. 128); Effectiveness of DDT in the Control of Ticks on Vegetation, by C. N. Smith and H. K. Gouck (pp. 128-130); DDT in the Control of Ticks on Dogs, by H. K. Gouck and C. N. Smith (p. 130); DDT, Sulfur, and Other Insecticides for the Control of Chiggers, by C. N. Smith and H. K. Gouck (pp. 131-132); DDT for Control of Gulf Coast and Spinose Ear Ticks, by C. S. Rude and C. L. Smith (p. 132); The Effectiveness of DDT as a Residual Spray Against Houseflies, by A. W. Lindquist, A. H. Madden, H. G. Wilson, and H. A. Jones (pp. 132-134); Residual Effect of DDT Against Houseflies, by E. R. Van Leeuwen (p. 134); DDT as a Barn Spray in Stablefly Control, by E. B. Blakeslee (pp. 134-135); The Use of DDT in the Treatment of Manure for Fly Control, by S. W. Simmons and M. Wright (p. 135); Relative Effectiveness of DDT and Rotenone Against Houseflies, by W. T. Hunt (p. 136); DDT as a Flyspray on Range Cattle, by R. W. Wells (pp. 136-137); Laboratory Tests on Houseflies With DDT in Contact Sprays, by W. A. Gersdorff and E. R. McGovran (p. 137); DDT for the Control of Goat Lice, by O. G. Babcock (p. 138); DDT as a Treatment for Fleas on Dogs, by A. W. Lindquist, A. H. Madden, and E. F. Knipling (p. 138); DDT as a [Cock]roach Poison, by A. W. Morrill, Jr. (p. 138); Efficacy of DDT as a [Cock]-roach Poison, by J. B. Gahan and E. F. Knipling (pp. 138-139); Toxicity of DDT to Bedbugs, Cockroaches, the Mexican Bean Beetle, and Housefly Larvae, by E. R. McGovran, H. H. Richardson, and P. G. Piquett (pp. 139-140); Tests of DDT Against Ants and Termites, by R. A. St. George (p. 140); The Possible Utility of DDT for Insect-Proofing Paper Bags, by R. T. Cotton, A. I. Balzer, and H. D. Young (p. 140); Laboratory Tests of DDT Against Various Insect Pests, by M. C. Swingle and E. L. Mayer (pp. 141-142); Tests with DDT on the More Important Cotton Insects, by E. E. Ivy (p. 142) (coop. Tex. Expt. Sta.); DDT and Other Insecticides for the Say Stinkbug and the Tarnished Plant Bug, by O. A. Hills (pp. 142-143); Tests with DDT Against Pentatomids, Mirids, the Bollworm, and the Cotton Aphid, by W. A. Stevenson, L. Sheets and J. M. Breazeale (p. 143); DDT for Control of Thrips on Cotton, by I. Shiller and C. A. Richmond (pp. 143-144) (coop. Tex. Sta.); Tests With DDT Against a Stinkbug [*Chlorochroa ligata* (Say)] and the Cotton Leafworm, by J. C. Clark (p. 144) (coop. Tex. Sta.); Tests With DDT Against the Boll Weevil, by G. L. Smith (p. 144); Tests of DDT Dust Aganist the Sugarcane Borer, the Yellow Sugarcane Aphid [*Sipha flava* Forbes], and the Argentine Ant, by J. W. Ingram (pp. 144-145); DDT Against the White-Fringed Beetle and the Velvetbean Caterpillar, by H. C. Young (pp. 145-147); DDT to Control the Tobacco Moth and the Cigarette Beetle, by J.

N. Tenhet (pp. 147-148); Cage Tests With DDT Against Certain Insects Affecting Tobacco, by F. S. Chamberlin (p. 148); Laboratory Cage Tests of DDT in Grasshopper Baits, by E. J. Hinman (p. 148); Efficiency of DDT as a Dust and in Bait for Grasshopper Control, by C. C. Wilson (pp. 148-149); DDT as a Substitute for Derris Against the European Corn Borer, by D. D. Questel (pp. 149-150); DDT Against Some Pests of Vegetable Crops, by C. A. Weigel (p. 150); Tests With DDT Against the Pea Weevil, by R. Schopp and T. A. Brindley (pp. 150-151); Laboratory Tests With DDT Against the Pea Aphid and the Mexican Bean Beetle, by F. H. Harries (p. 151); Field Experiments on DDT for Control of the Mexican Bean Beetle, by R. H. Nelson (p. 151); DDT for Control of the Tomato Fruitworm, by G. V. Johnson (pp. 151-152); Field Experiments With DDT Against the Potato Leafhopper and the Turnip Aphid, by N. F. Howard (p. 152); Field Tests With DDT and Other Insecticides Against Cabbage Caterpillars, by C. E. Smith and P. K. Harrison (pp. 152-153); Tests of DDT for Cabbage Insects and Squash Bugs, by P. K. Harrison (pp. 153-154); DDT to Control Thrips on Gladiolus, by F. F. Smith (pp. 154-155); DDT as a Protective Spray Against the Japanese Beetle, by W. E. Fleming and R. D. Chisholm (p. 155); Laboratory and Field Tests of DDT for Control of the Codling Moth, by L. F. Steiner, C. H. Arnold, and S. A. Summerland (pp. 156-157); Laboratory Tests of DDT Against the Codling Moth, by E. H. Siegler (pp. 157-158); Tests of DDT as a Contact Insecticide Against Females of the Fall Cankerworm, by J. V. Schaffner, Jr. (p. 158); DDT and the Mexican Fruitfly, by C. C. Plummer (p. 158); and DDT as a Stomach and Contact Poison for Honeybees, by E. C. Holst (p. 159).

The locust plague, B. P. Uvarov (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 93-99*).—This is a brief historical account of the locust problem—one from which none of the five continents is free—beginning with early Biblical and Egyptian times and tracing the distribution of locust plagues and advances in their study and control to the present time, with a final note on the outlook for the future.

Nature and extent of Mormon cricket damage to crop and range plants, R. B. Swain (*U. S. Dept. Agr., Tech. Bul. 866 (1943), pp. 44, illus. 13*).—Field studies of Mormon cricket injuries to crop and range plants were made in all the major infestations and outbreak areas of Nevada, Idaho, Oregon, and adjacent States (1938-39), the damage being measured as percentage loss in seasonal forage production and dry weight of herbage. The survey methods originally developed and used in estimating forage production and utilization by livestock are described. The Mormon cricket is a general plant feeder but has definite preferences for certain plants and plant parts. Most of the crops in its range are choice food and may be completely destroyed if unprotected. Injuries to the principal forage grasses and weeds were severe in certain northern desert shrub areas in Oregon, Nevada, Idaho, and Utah; in successive years and limited areas almost total destruction of livestock forage has been caused by this pest. Over most of its range, and particularly in the mixed prairies of Montana, South Dakota, Wyoming, and Nebraska, the Mormon cricket causes only slight or negligible damage to native vegetation. The influences of seasonal, climatic, and biological factors on its feeding behavior are discussed, and over 400 species are included in a classified list of its food plants.

A Californian Acinopterus (Homoptera: Cicadellidae), D. J. Knull. (Ohio State Univ.). (*Ent. News, 55 (1944), No. 3, pp. 62-63, illus. 1*).—*A. morongoensis* n. sp. is described.

Fijiian Tingitidae (Hemiptera), C. J. Drake and M. E. Poor. (Iowa State Col.) (*Bernice P. Bishop Mus. Occas. Papers, 17 (1943), No. 15, pp. 191-205, illus. 7*).—The authors enumerate 17 species and 1 variety of tingitids from

Fiji, including 2 genera, 11 species, and 1 variety described as new.

New Coleoptera with notes (Buprestidae and Cerambycidae), J. N. KNULL. (Ohio State Univ.). (*Ohio Jour. Sci., 44 (1944), No. 2, pp. 90-93, illus. 8*).—New taxonomy is involved in 5 of the 12 beetles here considered.

Selection of soil entrance and oviposition sites by June beetles, F. D. MINER. (Univ. Ark.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 16-18*).—Factors influencing choice of sites for soil entrance and oviposition were studied under cage conditions after noting that beetles in the field frequently use debris near food plants as daytime hiding places. In one test there was no apparent choice among plant species by *Phyllophaga fervida* as measured by total oviposition, though there was some indication that thicker plant stands were preferred. Little difference in oviposition was noted in a wide selection of soils under the uniform moisture conditions maintained. Other tests indicated that soil covered with partly rotted wheat straw was more attractive to *P. fervida* and *P. crassissima* as a place of entrance than soil with growing wheat seedlings. The presence of wheat roots in the soil appeared to stimulate oviposition by *P. crassissima.*

Food studies of Geocoris spp., predators of the beet leafhopper, G. T. YORK. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 25-29, illus. 2*).—The experiments reported were designed to determine the role of plants and animals as food for two species of big-eyed bugs (Lygaeidae)—*G. punctipes* Say and *G. pallens* Stål—as fundamental information needed in a projected attempt to utilize these predaceous insects in the biological control of the beet leafhopper. Cage tests at the Modesto (Calif.) laboratory showed that these two species could not live on a diet of either insects or plants alone, but required a combination of the two; apparently the plants served only as a source of water. With plants available, they lived equally well on beet leafhoppers alive, dead and preserved by refrigeration, or dead and air-dried. Mortality was increased, however, if the leafhoppers furnished as food had been treated in ether, although even then some sustenance was available. The presence of dead leafhoppers did not reduce the feeding on live leafhoppers. During summer the *Geocoris* adults consumed about one adult leafhopper every 2 days. These predators also consumed the eggs of the beet leafhopper laid in plant tissues; the average daily consumption by *G. pallens* during summer was 2.5 eggs for males and 4 for females. The practicability of testing these predators as a factor of natural control is pointed out.

Strains of the European corn borer in the United States, K.D.ARBUTHNOT (*U. S. Dept. Agr., Tech. Bul. 869 (1944), pp. 20, illus. 4*).—Controlled laboratory experiments were conducted (1937-40) on larvae collected from fields near New Haven, Conn., to represent test insects from the Eastern States, and from Toledo, Ohio, Mount Clemens, Mich., and Rochester, N. Y., to represent test insects from the Lake States, to determine whether inherently different strains occur in the United States and to study their physiological relationships. The New Haven material proved to be homozygous for the multiple-generation strain (nondiapause) and that from Toledo was heterozygous—a complex of multiple- and single-generation (obligatory diapause) strains. A homozygous single-generation strain was segregated from Toledo material, but singleness (recessive) persisted in selections for a homozygous multiple-generation strain. The single-generation strain larvae grew more slowly than the multiple-generation strain larvae. The heterozygous multiple-segregates from Toledo pupated more slowly than the multiple-generation strain from New Haven. Moths from both these field stocks exhibited a preference for mating among individuals from their own locality rather than for crossing between stocks; mating of New Haven ♀ ♀ with Toledo ♂ ♂ was not often ac-

complished, apparently because of a strain inhibition. In crosses between the two regional stocks, heterosis was evident in F_1. The Toledo ♀ × New Haven ♂ cross produced progeny resembling the paternal parent. The reciprocal cross produced (1) diapause and nondiapause phenotypes and a preponderance of ♂ ♂ in the nondiapause part of F_1 and (2) a retarded larval development in F_2—both being evidence of paternal diapause characters. The existence of distinct biological strains was demonstrated.

Reduced dosages of calcium arsenate and cryolite for control of the boll weevil and their effect on the cotton aphid, L. C. Fife. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 19-21*).—Owing to the potential scarcity of arsenicals during the war, tests were conducted in Texas (1942) to determine the effects of reduced dosages of calcium arsenate and cryolite on the boll weevil and the cotton aphid. Two series of field plat tests were carried out, each consisting of four replicated randomized blocks; applications were made at 5-day intervals from July 3 to August 12 in series (1) and from July 20 to August 27 in series (2). In (1), significant increases in yield of seed cotton were obtained in plats treated with calcium arsenate alone or mixed with sulfur. The yield from treatment with cryolite or cryolite-S mixtures was greater than in the control, but only in one case was it significant. In (2), the yields with calcium arsenate alone or in 1 : 1 mixture with S were significantly better than for the control. It was doubted whether S should be considered inert as it is somewhat effective against other insects such as pentatomids and mirids. It is believed that a considerable part of the gain from some of the treatments was due to the control of a mirid, *Creontiades signatus* (Dist.). Yields were increased with cryolite and the 1 : 2 cryolite-S mixture and significantly so by 1 : 3 cryolite-S; the 1 : 1 mixture of basic copper arsenate and S gave less increase than calcium arsenate or its 1 : 1 mixture with S. Only the plats treated with calcium arsenate or with its 1 : 2 mixture with S gave significant reductions in weevil infestation. Aphids never became abundant enough to cause appreciable injury. Except for the plats treated with the 1 : 5 calcium arsenate-S mixture, dusting calcium arsenate or its mixtures with S caused significant increases in the aphid population in (1). Cryolite or cryolite-S mixtures were not followed by significant increases in aphid populations.

Protecting potatoes from insect pests, W. A. Rawlins. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 12, 16*).—A practical account.

Biological studies of two potato flea beetles in eastern Washington, E. W. Jones. (U. S. D. A. coop. Wash. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 9-12, illus. 2*).—A study of the potato flea beetle and the western potato flea beetle was conducted in eastern Washington, with special reference to their abundance, habits, and ability to injure potato tubers. Each species was reared in the laboratory and in outdoor cages and, although the western potato flea beetle required a little longer to complete development, the developmental periods appeared to be similar. The western species was much more abundant but was not observed to injure the tubers; the other species caused severe damage. Flight habits were similar, both species being observed to fly rather close to the ground and only on calm days.

Estimation of damage to potato foliage by potato moth, Gnorimoschema operculella (Zell.), J. G. Bald and G. A. H. Helson (*Jour. Council Sci. and Indus. Res. [Austral.], 17 (1944), No. 1, pp. 30-48, illus. 4*).—The leaf area of about 30 potato plants (6 early- and 6 late-maturing) were measured periodically

during the earlier growth stages, the last giving an estimate of the leaf tissue destroyed by the potato tuber worm, as well as information on the mode of attack. Coincident with the last leaf measurement and until the tops of the earliest strains were nearly dead, ratings of individual plants were made on a five-point scale according to the extent of leaf area destroyed. In this way the damage ratings were found influenced by the growth habit of the varieties; those with open foliage were rated higher than the dense varieties because the damage could be more easily seen. The injury might also be influenced by growth conditions, having little to do with the number of larvae present. Significant differences in the reactions of strains and varieties to infestation were associated with variations in the rate at which leaf tissues destroyed were replaced by the growth of axillary shoots. There was no evidence of preference by the largae for one variety over another. Yields of infested plants were approximately proportional to the amount of leaf area left undamaged. This provides a logical basis for the rating method of estimating the damage; its uses and limitations are discussed.

The potato tuber moth as a host for mass production of Macrocentrus ancylivorus, G. L. FINNEY, S. E. FLANDERS, and H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 61-64, illus. 4*).—The potato tuber worm has proved an ideal insectary host for mass production of *M. ancylivorus* Roh. The need for such production in California is associated with the discovery of the oriental fruit moth in that State in 1942; also, it is now intended to test *M. ancylivorus* as a possible control for the potato tuber worm in certain areas. The use of potato tubers as a medium for propagating the latter host of *Macrocentrus* permits the year-round production with a minimum of labor and space. If adequately infested, the potato is completely utilized within 20 days. Detailed descriptions are given of the equipment designed for the purpose, the procedures for producing moths and parasites, moth egg production for breeding stock, and of parasite production for orchard use. According to present plans for orchard colonization, the cocooning sheets containing *Macrocentrus* cocoons within the host cocoons will be assembled to form triangular cases. Each case is to be made up and banded with wire. Those with parasites about to emerge will be shipped in cardboard containers to the points of liberation, where they can then be suspended in the peach trees by the loose ends of the wire bands.

Control of the tobacco flea beetle by cultural practices in plant beds, J. U. GILMORE and C. LEVIN. (U. S. D. A. coop. N. C. Expt. Sta. et al.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 13-15, illus. 1*).—Tobacco plant beds were shown to be prolific sources of populations of this flea beetle in flue-cured tobacco areas. After the crop has been transplanted the plant beds continue to furnish large numbers of flea beetles throughout the season; unless destroyed, they are thus a menace. Three methods of disposal were tried, viz, plowing the plants plus scraping the soil surface with a hoe, plowing and harrowing, and plowing only. Any one of these methods resulted in an appreciable reduction in the potential flea beetle population developing in the beds; the first two methods, however, proved most effective.

Asparagus beetles are rather easily controlled, G. E. R. HERVEY. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 13, 14, 15, illus. 2*).—A practical account.

Control of the Mexican bean beetle in irrigated districts in the West, R. L. WALLIS (*U. S. Dept. Agr. Cir. 675 (1944), pp. 12, illus. 3*).—The control of this pest on beans grown for the dry-bean market on irrigated land was investigated at Grand Junction, Colo. (1935-38). Sprays were applied with field

equipment on plats of approximately 1 acre each, and with four replicates each season. Results were determined as percentage control, yield difference, and net return on treated v. check plats. The first application was made after emergence of the hibernated beetles was complete (first week in July) and before many eggs had been laid; this killed the overwintered beetles and thus stopped oviposition. Furthermore, larvae hatching from eggs already deposited feed for a few days on the leaf where they hatch. If the spray is applied before all beetles enter the field, new foliage will be available for the latecomers within a few days after application; if there are fewer beetles than 5 per 50 ft. of row, the first spray application may be delayed a few days.

Derris or cube containing 0.02 percent and derris containing 0.015 percent rotenone gave satisfactory control (78–99 percent) and good financial gains. During the war, however, it is suggested that, whenever possible, other materials be substituted for rotenone. Because of costs, derris and cube may not be used so much on the dry-bean crop as cryolite and zinc arsenite. The latter spray resulted in good control but also in a financial gain slightly less than that by rotenone materials or cryolite; this suggests the possibility of some foliage injury, as has been reported by others. Calcium arsenate spray gave 81-89 percent control, but the financial gains averaged about half that for cryolite and rotenone materials. Magnesium arsenate and barium fluosilicate are not to be recommended on crops grown for dry beans in the West. Power sprayers giving at least 150 pounds' pressure should be used, with spray nozzles so arranged that all plant parts will be covered. The cost of spraying in these experiments ranged from 70 ct. to $3.85 per acre, depending on materials, number of applications, and cost of labor.

The relative effectiveness of two types of arsenate of lead used to control the codling moth, B. C. Dickinson and E. D. Witman (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 43-46, illus. 2*).—Information is presented from the results of a laboratory study on the relative efficiency of the so-called "amorphous" and "crystalline" arsenate of lead. Electron micrographs showed both to be crystalline in structure. In the case of the "crystalline" there appeared to be an increased aggregation of the individual particles to form a larger platelet. There was no consistent difference in the relative effectiveness of the two types for controlling codling moth larvae; both also exhibited considerable repellency, a factor that should be given more consideration in insecticidal investigations.

Changes in ratio of lead to arsenious oxide in lead arsenate residues on apples, J. E. Fahey. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 33-36*).—Because of the debatable significance of existing data on lead-arsenious oxide ratios in lead arsenate, it was considered advisable to investigate the subject further. During the 1941 season an experiment was set up for examining lead arsenate residues resulting from various types of sprays, in this case using an improved method for measuring the changes in ratio. By these means it was shown that when lead arsenate was used without auxiliary spray materials, the change in ratio of lead to arsenious oxide in the residue deposit became significant only when the residues were allowed to weather for extended periods. Addition of mineral oil, bordeaux, or both, to the spray reduced the decomposition rate. On the other hand, addition of lime accelerated the decomposition rate, the changes in ratio being relatively great and significant even when the weathering period was short. These conclusions confirm the results of Pearce and Avens (E. S. R., 84, p. 643), as well as those previously reported by Fahey and Rusk (E. S. R., 81, p. 543). By the improvement in methods of

study it has been possible to show some of these small differences in ratio of lead to arsenious oxide to be significant at odds of 99 to 1.

The development of large differences in the ability of local codling moths to enter sprayed apples, L. F. Steiner, C. H. Arnold, and S. A. Summerland. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 29-33*).—Laboratory and orchard tests with over 14,000 newly hatched codling moth larvae from each of two similarly situated orchards in the Ohio and lower Wabash Valleys indicated that differences among populations in their ability to enter sprayed fruit have apparently developed within the past 5 yr. These orchards were sprayed alike prior to 1936. Larvae from one, which has since been sprayed heavily with lead arsenate, were able to enter fruit sprayed with lead arsenate, nicotine bentonite, cryolite, or xanthone, but not phenothiazine, in significantly larger numbers than those from the other orchard, which was not sprayed after 1936. No differences were found in the ability of the two strains to enter unsprayed fruit or in the resistance of their eggs to xanthone, micronized nicotine bentonite, mineral oil, or mineral oil-nicotine sprays. Observations denoted that the strain least susceptible to lead asenate took less time in attempting entrance and crawled shorter distances over sprayed fruit than the more susceptible strain, suggesting that the difference in so-called resistance might be behavioristic rather than due to general vigor. The apparent resistance of the one strain to lead arsenate was considerably greater than to nicotine; consequently the latter gave better results in laboratory tests against the more resistant strain but poorer results against the less resistant strain. The findings suggest that increases in the proportion of resistant strains in a codling moth population can be retarded, if not prevented, by utilizing more supplementary measures and insecticides that kill a larger proportion of the adults and eggs than does lead arsenate. They also show the need for a survey of the variation in apparent resistance that may exist among different orchard populations in localities where comparative tests of insecticides are being made.

Xanthone in the control of codling moth and mites on apples and pears in California, A. D. Borden. (Univ. Calif.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 36-42*).—In the search for a lead arsenate substitute to control codling moth on apple and pear, a number of commercial products have been tested; the present study sought a material which could be safely and efficiently used in the cover sprays after lead arsenate. In the pear areas of the State the lead arsenate program fails to protect against the European red mite and *Tetranychus bimaculatus* unless summer oil emulsion is added in the late cover sprays; this complicates spray residue removal. Xanthone is one of the most promising materials adequate to meet the requirements and may soon be available for commercial use; detailed results of some eight orchard tests are here presented, along with information on its toxicity, mixing, spreaders and adhesives, and on its use in late cover sprays. Xanthone is much less toxic to man than the arsenates, and its residues are considered noninjurious and are easily removed. Used at the rate of 2 lb. per 100 gal. water, following two arsenical sprays, xanthone appeared to meet the requirements of a substitute for lead arsenate under California conditions, not only controlling codling moth but also preventing mite injury on pears and arsenical foliage injury on apples in the coastal areas. It should not be combined with oil emulsions or used too early on apples, especially during comparatively warm days; no injury to Bartlett pears was observed.

The effect on peach trees of ethylene dichloride used for control of the peach-

tree borer, O. I. Snapp and E. P. Cullinan. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 47-51*).—In the tests reported, no injury resulted from treating trees in several different soils and wide ranges of conditions when ethylene dichloride was used at the recommended amount and strength (mature trees 0.5 pt. of 20 percent and 3-year-old trees 0.5 pt. of 15 percent emulsion) on the soil around the base of the trees in such a way that none touched the trunk directly. Soil moisture content had no effect on injury when the emulsion was applied early in October, nor did injury increase when it was applied to moderately dry soil in mid-November; injury did occur, however, when used at higher amounts or strengths in waterlogged heavy soil under the low temperature conditions of late fall. The injury was more severe in the heavy soils, and applying the emulsion directly to the tree trunks also increased the damage.

Factors influencing protective stupefaction of the California red scale with HCN, H. R. Yust, H. D. Nelson, and R. I. Busbey. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 57-61*).—Resistant individuals were tested in the laboratory under controlled conditions to determine the influence of different factors on the amount of protective stupefaction induced by prefumigation with a very low concentration of HCN prior to the regular fumigation concentration. Mature females required less HCN for stupefaction than scales in the second molt. With prefumigation, the relative susceptibility of scales in the second molt and mature female scales was influenced by the prefumigation concentration; a higher concentration was required to stupefy both stages with a temperature rise from 50° to 77° F. Some concentrations inducing protective stupefaction gave a slight mortality. In general, the mature females remained stupefied longer than scales in the second molt; the period over which it continued was influenced by the prefumigation concentration and the temperature. With mature females the period decreased with rise in temperature from 50° to 77°, and at 77° the kill of those stupefied 2 hr. earlier was higher than for those not subjected to protective stupefaction.

Determination of oil deposit on citrus leaves by the steam-distillation method, F. A. Gunther and J. P. LaDue. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 52-56, illus. 1*).—Directions are given for adapting a steam-distillation method of determining oil deposits of two of the lighter and four of the standard grades of spray oils on lemon leaves. The major difference between this and the kerosene adaptation previously described (E. S. R., 88, p. 74) lies in the use of dilute phosphoric acid in place of an aqueous solution of H_2SO_4, HNO_3, and $Al_3(SO_4)_3$ as the decomposition medium. Data are presented to justify the alterations adopted for this expanded utility and to indicate the high degree of reproducibility and efficiency of the new adaptation. The results of 42 representative calibration runs (7 runs for each of the 6 oils studied) indicate an average standard deviation of 1.63 percent for these oils.

Toxicity of anabasine to the citrus thrips, E. A. McGregor. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 78-80*).—Anabasine alkaloid solutions at 1–2,000 to 1–1,000 and anabasine sulfate (40 percent anabasine) at 1–800 to 1–600, both with and without sugar, exhibited high toxicity to the citrus thrips in laboratory tests. Sugar or some other added material is probably of value in retarding loss of the toxic material. The thrips do not seem to feed on the anabasine-sugar residues, the material apparently acting by contact and by fumigation. The indicated range of this fumigation effect was less than 0.5 in. On coming under the influence of anabasine the thrips underwent convulsions, followed by paralysis within 9–14 min. after exposure.

Insects associated with the Palay rubber vine in Haiti, P. KNIGHT (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 100-102.*)—The Palay rubber plant (*Cryptostegia grandiflora*) is being planted on a large scale in the Republic of Haiti in connection with the emergency rubber program of several cooperating agencies of the United States Government. Since close to 100,000 acres were scheduled to be planted before the end of 1943 in very extensive tracts, some knowldge of the pests may be needed as the plantations mature; in fact there is evidence that some insects attacking this plant may develop to epidemic proportions as the acreage increases. Here is presented a brief summary of a more extensive report submitted to the Research Division of the Cryptostegia Project of the Société Haitiano-Américaine de Developpement Agricole, Port-au-Prince, Haiti.

The fumigation of camellia and azalea cuttings with methyl bromide, L. L. ENGLISH and G. F. TURNIPSEED. (Ala. Expt. Sta. et al.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 81-84*).—Fumigation of camellia and azalea plants with methyl bromide for controlling such pests as the southern red mite, greenhouse thrips, camellia scale, and *Fiorinia theae* Green having proved successful (E. S. R., 90, p. 377), further tests were made with cuttings from 58 varieties of azalea and 45 of camellia which indicated that most of them could be safely fumigated at such dosages but that cuttings from Coral Bell and Salmon Beauty azaleas apparently cannot be satisfactorily fumigated with methyl bromide. In a series of approximately equivalent dosages and exposures at various temperatures, the long exposures required with 0.5 lb. per 1,000 cu. ft. proved detrimental to the survival of cuttings. Rooted cuttings placed in flats of moist sand were also fumigated when removed from the greenhouse for transplanting, and since several thousand cuttings can be fumigated in a relatively small chamber this practice affords a cheap method of producing clean plants. Schedules of 2 lb. per 1,000 cu. ft. with an exposure of 1.25 hr. at 90° F. and 2 lb. for 2.25 hr. at 80° meet the practical requirements.

Summer infestation of farm-stored grain by migrating insects, R. B. SCHWITZGEBEL and H. H. WALKDEN. (U. S. D. A. coop. Kans. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 21-24*).—This study was conducted (1941-42) at a Kansas site containing about 190 wheat storage bins varying in capacity from 1,000 to 5,000 bu.; possible sources of insect infestation were the wheat stored in bins on the site, a country elevator nearby, and surrounding farm land. The detailed data from insects captured by use of flight screens, bin traps, and a revolving insect trap in the vicinity of bins of wheat and actually entering the bins indicated that during July-September migrating insects constitute an important source of infestation to farm-stored grain. Many of the species caught are of little importance to grain that is in good condition—e. g., the foreign grain beetle *Ashasverus advena* (Waltl.) and the hairy fungus beetle *Typhaea stercorea* (L)., which are attracted to high-moisture grain and feed chiefly on molds growing on decaying grain. The lesser grain borer, on the other hand, is a serious pest of stored grain, as is also the rice weevil. The flat grain beetle and the red flour beetle are often associated with heating grain and are frequently responsible for the caking of surface grain.

Taxonomy of the moths infesting stored food products, A. S. CORBET. (*Nature [London], 152 (1943), No. 3869, pp. 742-743*).—The war served to emphasize moths the larvae of which infest stored food products, and it became apparent that knowledge of the systematics of these insects was far from complete. A reinvestigation of the taxonomy of the species involved was therefore carried out by the author in collaboration with W. H. T. Tams, and a brief general and preliminary discussion is here given.

Value and use of volatile nitriles for household fumigation, E. H. Glass. (Ohio State Univ. et al.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 74-78*).—Tests in a 740-cu. ft. fumigation chamber demonstrated that trichloroacetonitrile and its 50–50 mixture with acrylonitrile are more effective against insects at 80° than at 60° F., that moist conditions prolong the required aeration period several hours, and that an increase in the moisture content of furnishings within 1–2 days after fumigation may cause eye irritation after the eye test has become negative under dry conditions. The results of several house fumigations indicated that trichloroacetonitrile is peculiarly useful for this purpose. Because it is very toxic to insects, penetrates well, and airs out rapidly, it is possible to fumigate a house during the daytime, ventilate for a few hours, and admit the occupants by night. There is practically no danger from its use, since it is a lachrymator and persons cannot tolerate fatal concentrations; wearing of a gas mask while working with these nitriles is, however, desirable. A burning sensation in the scrotum may result from prolonged exposure to the fumes; this unpleasant effect can be avoided by taking simple precautions during application and aeration. In tight buildings, 2 lb. per 1,000 cu. ft. for 6 hr. or 1.5 lb. for 12 hr. should be adequate even for resistant clothes moths and carpet beetles. Acrylonitrile may be used successfully in the 50–50 mixture with trichloroacetonitrile for house fumigations, though slightly higher concentrations or longer exposures may be necessary, particularly when the above insects are present. The same routine and precautions should be observed with this mixture as for the trichloroacetonitrile alone.

New distribution records for the mosquitoes of the southeastern United States in 1943, W. W. Middlekauff and S. J. Carpenter (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 88-92*).—The continuation of the United States Army's mosquito survey program, now in its second season, has added further material on the abundance and distribution of the mosquito fauna of the seven States (Fla., Ga., Ala., Miss., Tenn., N. C., and S. C.) in the southeastern part of the country comprising the Fourth Service Command. A considerable number of new State records as well as new locality records have been added, as well as a new species of *Aedes* to be described later. Annotated lists by genera and species and by States are presented.

Notes on the collection and oviposition of Anopheles walkeri, J. M. Ellis (*Jour. Tenn. Acad. Sci., 19 (1944), No. 1, pp. 29-30*).—Because of the increasing implications that this mosquito is a potential malaria vector, any new information on its incidence and habits is of interest; brief field notes and observations on its oviposition are here presented.

Sprays for the control of ticks about houses or camps, C. N. Smith and H. K. Gouck. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 1, pp. 85-87*).—A 1–200 spray of nicotine sulfate (40 percent) reduced the abundance of the American dog tick on vegetation by about 90 percent for 2–3 days without injuring the plants. However, since many of the ticks recovered, the material is recommended only where temporary reductions are required. A spray containing 1.5 percent sodium fluoride and 0.5 percent nicotine sulfate gave a quick knock-down and actual kill, but proved injurious to foliage. It was effective against the American dog tick, the black-legged tick, and the lone star tick, but not against the chigger *Acariscus masoni,* and is recommended where permanent reduction in tick abundance is desired and no valuable plants are concerned. Some preparations of dinitro-*o*-cyclohexylphenol proved almost as effective against the American dog tick as sodium fluoride, but were equally injurious to foliage. A spray con-

taining 2.6 cc. purified pyrethrum extract to 1 gal. water with an activator was as effective as sodium fluoride and nicotine sulfate against the lone star tick, and even weaker dilutions were effective against the black-legged tick; it was not injurious to foliage but is now unavailable for civilian use for this purpose. With each of the three preceding materials an immediate reduction in tick abundance of more than 90 percent was realized. The rapidity of reinfestation of the sprayed area varied with the numbers of molting and migrating ticks; in most cases the reduction was at least 75 percent for a week.

Bee losses and Utah agriculture, G. R. KNOWLTON (*Farm and Home Sci. [Utah. Sta.], 5 (1944), No. 1, pp. 3, 11*).—A practical account.

ANIMAL PRODUCTION

Practical animal husbandry, W. C. MILLER and E. D. S. ROBERTSON (*Edinburgh: Oliver & Boyd, 1943, 3. ed., rev. and enl., pp. 496+, illus. 219*).—A popular presentation of animal and poultry production, with emphasis on horse husbandry.

Some interrelated problems of the animal industry and of human nutrition in the war emergency, L. A. MAYNARD. (Cornell Univ.). (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 88-90*).—In this presidential address of the American Society of Animal Production it is stated that in livestock production a maximum of roughages should be utilized with a minimum of cereals and concentrates, which may thus be left available for human foods.

The feeding of livestock, A. G. HOGAN (*Missouri Sta. Bul. 330, rev. (1943), pp. 43, illus. 9*).—This revision (E. S. R., 71, p. 81) takes account of the composition of feeds and the needs of animals of different species for various nutrients and minerals.

Animals as feed processors, H. H. MITCHELL. (Univ. Ill.). (*Flour & Feed, 44 (1944), No. 11, pp. 16-20*).—A general statement of the conversion of feeds to foods by different animals, with special reference to ruminants, and the synthesis of proteins and vitamins.

Factors involved in the synthesis of vitamins in the ruminant, B. W. FAIRBANKS and J. L. KRIDER. (Univ. Ill.). (*North Amer. Vet., 25 (1944), Nos. 1, pp. 22-25; 2, pp. 97-100*).—Attention is called to the fact that thiamine, riboflavin, nicotinic acid, pantothenic acid, pyridoxine, biotin, and vitamin K are synthesized in the rumen, and that newer members of the vitamin B complex may also be synthesized by ruminants, but age is a factor since young animals do not ruminate. Synthesis of vitamin C does not appear to be in the rumen but rather in the tissues of the body.

Digestion experiments with range forages and flax hulls, H. R. GUILBERT and H. GOSS (*California Sta. Bul. 684 (1944), pp. 10*).—Employing methods similar to those utilized in digestion trials of fruit byproducts with wethers (E. S. R., 56, p. 261), the total digestible nutrients of annual range grasses and filaree was found to be high enough so that grazing animals could gain weight provided the protein deficiency was corrected by supplemental feeding. Flax hulls were comparable with poor straw but were more palatable. Spanish clover was surprisingly low in digestibility. Lignin, cellulose, and other carbohydrate fractions were also fed in the digestibility experiments. In vitro pepsin and hydrochloric acid digestion was found to be useful in predicting relative values of the range feeds.

A comparison of different grains for feed production in North Dakota, R. W. SMITH and T. E. STOA. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo.*

Bul., 6 (1944), No. 4, pp. 13-17).—When both the grain and straw were considered, there was little difference in the calculated yields of digestible protein or total digestible nutrients per acre from corn, barley, oats, and wheat at the Dickinson Substation over about a 20-yr. period. In 4 years' tests at Fargo there were no great differences in the amounts of digestible protein produced by red durum wheat, two varieties of oats, Manchurian barley, and two varieties of spelt when sown early or late. Careful selection of the crop and variety insures the highest yield and feed value. Two or more crops insure a more stable feed supply than one crop.

Producing choice finished yearlings with a maximum of roughage and grass and a minimum of grain, B. R. Taylor (*Oklahoma Sta. Mimeog. Cir. 105 (1943), pp. 6-14*).—In 3 years' trials of the most profitable plan for using a maximum of roughage and marketing good to choice beef, it was found that the preferable method was to winter choice steer calves to produce 200–250 lb. of winter gain, grazing for 90 days without grain on bluestem grass, then full-feeding for 90-100 days in dry lot. Buffalo grass proved less desirable than bluestem grass for grazing without grain. If one wishes to sell a feeder off grass, somewhat less gain than 236 lb. should be produced during the winter with grazing longer than midsummer and production of more gain off grass.

Fertility of range beef cattle, A. L. Baker and J. R. Quesenberry (U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 78-87*).—From the breeding and calving records on 4,753 cow-yr. at the U. S. D. A. Range Livestock Experiment Station, Miles City, Mont., over a period from 1925 to 1943, the average calf crop was 83.1 percent. Yearly variations due chiefly to environmental causes were statistically significant. A variation from 45.5 to 95 percent of the calves of different sires were born alive. The age of the bull did not have a significant effect on the calf crop, but weight was lost during the breeding season by older bulls. Single bull herds had approximately 6 percent more calves than multiple bull herds. The lowest calf crop was dropped by 4-year-old cows, and the highest in the 9-year-old group. Evidently selection aided in maintaining a high level of fertility. Cows failing to produce calves in 2 successive years, it is stated, should be culled.

A formula for figuring average yearly weights of breeding ewes from one yearly weighing, C. L. Cole (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 182-183*).—The corrected maintenance weights of 260 ewes of the Hampshire, Shropshire, Southdown, Oxford, Cotswold, Rambouillet, and Black Top Delaine breeds were predicted from the formula $16.72 + (0.851 \times \text{weight})$, with a standard error of estimate of less than 5 percent of the mean.

The relation between rates of growth and rickets in sheep on diets deficient in vitamin D, J. Duckworth, W. Godden, and W. Thomson (Jour. *Agr. Sci.* [*England*], *33 (1943) No. 4, pp. 190-196, illus. 2*).—The blood picture for calcium, inorganic phosphorus, and phosphatase of wether lambs during the development of rickets, on feeds which included a basal ration of turnips, linseed meal, and chopped straw with varying amounts of cornstarch and cod-liver oil and/or cottonseed oil, is presented. The earliest and most distinctive change was in the serum calcium level. The wethers had sufficient reserves of vitamin D to protect them against rickets at early ages, but after 6 weeks the serum calcium level began to fall, although rickets did not develop unless there was a moderate degree of growth, and in such cases the serum calcium level was less than 7 mg. per 100 cc. The study was conducted in two experiments with a total of nine lots of six wethers each, lasting in four lots 180 days and in the other five lots 240 days.

The influence of seasonal differences on the growth of Navajo lambs, C. T. Blunn. (U. S. D. A. et al.). (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 41-49*).—Highly significant differences were found between the mean weights at all ages to weaning, except birth, for Navajo lambs in 1928-41 at the U. S. D. A. Southwestern Range and Sheep Breeding Laboratory, Fort Wingate, N. Mex. Study of the variance of 739 lambs showed that the genetic factors were not as important in causing differences in weight between years as uncontrollable environmental conditions. Agreement between the variations in lamb weight and the precipitation in the different years was observed. The variance analysis was on weights of 739 lambs at birth and 4, 8, 12, 16, and 20 weeks of age. Additional information was included on 42 lambs having the same sires and dams and 117 lambs having the same sires but different dams. These showed essentially the same percentage effects between years and within years as were observed in the entire population.

The phosphorus requirement for fattening lambs, W. M. Beeson, R. F. Johnson, D. W. Bolin, and C. W. Hickman. (Idaho Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 63-70, illus. 1*).—The phosphorus requirement of lambs was studied in five experiments employing 675 western lambs with rations containing different amounts of phosphorus. When there was included 0.07–0.12 percent of phosphorus or 1.2–1.67 gm. of phosphorus per 100 lb. live weight, the lambs showed abnormally slow gains, high feed requirements, and specific symptoms of aphosphorosis such as depraved appetite, unthrifty appearance, and blood phosphorus of 4.17 mg. or less per 100 cc. A level of 0.14 percent phosphorus in the ration proved inadequate as the average daily gains produced were 0.22–0.26 lb. and there was inefficient feed utilization. Rations with 0.15–0.23 percent phosphorus or 2.17–3.38 gm. of phosphorus per 100 lb. live weight produced an average daily gain of about 0.3 lb., with efficient utilization and blood phosphorus between 6 and 7 mg. per 100 cc. Although somewhat less may be required, it is suggested that the optimum phosphorus feed requirement be set at 2.40 gm. per 100 lb. live weight or that the ration contain on a dry basis 0.17 percent or more phosphorus, an amount which produced excellent gains and feed utilization in the experiment. Evidently a phosphorus deficiency in lambs exerts a more depressing effect on the utilization of feed than on the appetite.

Iodine-fluorine relationships in sheep nutrition, J. D. Hatfield, C. L. Shrewsbury, F. N. Andrews, and L. P. Doyle. (Ind. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 71-77, illus. 6*).—In all of three experiments, lambs which received 6 mg. of fluorine from rock phosphate per kilogram of live weight grew less rapidly than lambs which received no fluorine. Additions of iodine in iodized salt in the third of these trials did not counteract the deleterious effect of fluorine on growth. Iodized salt fed in one experiment caused the production of thyroid glands that were normal with respect to iodine content and microscopic structure. The presence of fluorine in the ration increased the percentage of iodine in the thyroid gland, both when there was adequate and inadequate iodine intake. The total iodine in the thyroid was increased in some cases and decreased in others. Each of three experiments was conducted with four lots of four or five lambs each fed rock phosphate, supplying 0, 1.5, 3.0, and 6.0 mg. of fluorine per kilogram of body weight. There were variations in the salt consumption in that block salt was fed in the first experiment, iodine-free salt in the second, and iodized salt in the third. The thyroid glands were weighed, analyzed, and the pituitaries assayed with chicks for thyrotropic hormones (E. S. R., 82, p. 172) in the second and third experiments. The addition of iodine to various rations decreased the relative thyrotropic hormone content of the pituitaries.

Studies on Merino wool production: Fleece tests on stud sheep, V. Bosman (*Farming in So. Africa, 18 (1943), No. 212, pp. 789-794*).—Accumulated data and relevant researches have indicated that clean dry wool production of Merino stud rams should range from 10 to 16 lb. and that of stud ewes from 6 to 10.5 lb. A system of group testing involving less work and management might profitably be adopted. Calculated yields for different staple lengths and density are presented.

Influence of type of hog on production efficiency, J. H. Zeller and H. O. Hetzer (*U. S. Dept. Agr. Cir. 698 (1944), pp. 16, illus. 5*).—The results of a study of pigs born in litters of 54 small-type, 92 intermediate, and 97 large-type sows showed that the intermediate type was generally superior to the small or large type. Small-type hogs were generally less efficient performers even when slaughtered at 150 lb., and the large-type hogs had to be fed to weights over 225 lb. to attain sufficient finish to be graded choice. The gestation periods averaged 114.8, 115.7, and 116.7 days for small-, intermediate-; and large-type sows, respectively. The litters of large-type sows at weaning averaged one-tenth of a pig more than those of intermediate-type sows and the latter excelled small-type sows by one pig per litter at weaning. The large-type pigs were somewhat heavier at birth and weaning than intermediate-type pigs, and both were heavier than those of the small type. Intermediate-type hogs gained about 0.09 and 0.17 lb. more daily than large- and small-type hogs, respectively, and required about 6 and 21 lb. less feed per 100 lb. gain. If fed to the same degree of finish, intermediate-type hogs averaged 0.40 lb. more daily gain than small-type hogs, 0.03 lb. more than large-type hogs, and required about 10 lb. less feed per 100 lb. gain than either type. When fed to the same degree of finish, small-, intermediate-, and large-type hogs averaged 143, 214, and 252 lb., respectively. The study is based on the weaning and growth data of over 1,000 pigs born in 243 litters of the three types.

Pigs make excellent gains at the Williston Station, J. H. Longwell and W. H. Huber (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 4, pp. 21-32*).—The gains of 2 lots of 10 pigs each averaging 27 lb. live weight were approximately equal from June 12 to October 5, 1943. One lot was fed wheat and the other a mixture of corn and barley. Both groups were fed in dry lot and consumed about equal parts of the cereals and commercial protein supplements per unit of gain.

Pig Manamar for growing and fattening pigs, V. A. Freeman and G. A. Brown (*Michigan Sta. Quart. Bul. 26 (1944), No. 3, p. 177*).—One lot of 10 pigs self-fed on a mixture of corn, wheat, soybean meal, alfalfa, and minerals made an average daily gain of 1.42 lb., whereas another lot of 10 pigs fed corn, wheat, oats, Manamar, and minerals made an average daily gain of 1.31 lb. and required more feed per 100 lb. gain.

Vitamin, protein, and mineral supplements for growing and fattening fall pigs fed in dry lot, J. L. Krider (In *Cornell University Abstracts of Theses, 1942. Ithaca, N. Y.: Cornell Univ. Press, 1943, pp. 460-463*).—Data from experiments on growth of 267 fall-farrowed pigs emphasized the practical and economical benefits of including 5 percent good-quality sun-cured alfalfa as a source of vitamins A and D in dry-lot rations. Liver meal showed more improvement in unthrifty than in thrifty pigs.

The effects of wheat germ and corn germ on the feeding value of cereal grains for hogs, E. W. Crampton and G. C. Ashton (*Sci. Agr., 24 (1943), No. 2, pp. 78-85*).—Comparisons were made of rations consisting largely of cereals and cereal products in experiments with 10 lots of 12 pigs each, started at 65-

70 days of age, with 15 percent protein to 100 lb. of live weight and 10 percent protein to 200 lb. of live weight. The results showed that the nutritive properties of the cereal grains were in part dependent on the composition of their germ fractions, especially the amounts of the B complex contained therein. In arriving at this conclusion, the rations were made up of entire corn, degerminated corn, degerminated corn and wheat germ, entire wheat, degerminated wheat, degerminated wheat and corn germ, entire barley, degerminated barley, degerminated barley and wheat germ, and degerminated barley and corn germ in addition to the protein supplements. The average daily gains made with rations of the protein supplements and entire corn and degerminated corn were 1.10 and 0.82 lb., respectively, with increases to 1.57 and 0.92 lb. with entire wheat and degerminated wheat, respectively. Advantage of barley over corn was also shown by gains of 1.61 and 1.34 lb. produced by entire barley and degerminated barley, respectively. The advantages of wheat and barley over corn were also shown in the average daily gains induced by degerminated corn and wheat germ of 1.35 lb. and only 1.09 lb. by degerminated wheat and corn germ, but by degerminated barley and wheat germ gains of 1.51 were produced, with 1.43 lb. by degerminated barley and corn germ.

The relation of vitamin B_1 in the ration of the hog to the amount deposited in the tissue, M. E. Ensminger, E. J. Warwick, and W. Heinemann (*Washington Sta. Mimeog. Cir. 14 (1943), pp. 7*).—Five groups of two pigs each averaging about 80 lb. in weight were selected for a 55-day comparison of additions of varying supplements of thiamine and animal and plant proteins to a purified ration. Without supplement the average daily gain was 1.25 lb., but with 0.51 or 1.02 mg. of thiamine per kilogram of live weight the average daily gains were, respectively, 1.36 and 1.35 lb. Average daily gains of 1.29 and 0.99 lb. were produced with additions of vegetable and animal proteins. Preliminary analyses of various cuts of meat for thiamine show a relation between the vitamin B_1 intake of the pig and the B_1 content of the pork muscle.

Comparison of complex and simple mineral mixtures for pigs, J. H. Longwell and A. Severson (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 4, pp. 27-30*).—In comparing gains and feeding results with 5 lots of 12 pigs each, containing simple and complex mineral mixtures fed with the same grain feed for all, no advantages were shown for the complex mineral mixtures. The pigs with no minerals made an average daily gain of 1.25 lb. A maximum daily gain of 1.29 lb. was made by those receiving mineral mixtures with 40 parts of steamed bonemeal, 40 parts of ground limestone, and 20 parts of salt.

Twenty-one years' work (1919-1940) for the improvement of the Canadian horse breed as carried on at the St. Joachim Horse Farm, Quebec, J. P. Pelletier (*Ottawa: Canada Dept. Agr., Expt. Farms Serv., 1943, pp. 24, illus. 13*).—Line breeding and inbreeding combined with selection and culling gave good results in the quality and fertility of horses produced over a 15-yr. period. Early results in horse breeding showed that inbreeding had not given better results than crossbreeding, but in recent results with 153 animals, 31.6 percent inbreds were classified as very good and 63.1 percent as good, with no culls. Of the outbreds, 26.3 percent were classified as very good, 24.5 as good, and 23.7 percent culls. With 89 pregnant mares wintered inside and worked reasonably until foaling and 126 wintered outside with open-front sheds, equally good results were obtained. Data are included on costs of housing and feeding Canadian colts.

A B C of poultry raising: A complete guide for the beginner or expert, J. H. Florea (*New York: Greenberg, Inc., 1944, pp. 206+, illus. 72*).—Basic information on poultry production, with illustrations in color of males and females of several breeds.

Summer broiler production, J. A. Davidson, C. M. McCrary, and C. G. Card (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 227-232*).—Barred Rock, White Rock, and Cornish-Leghorn crossbred chicks were fed to 14 weeks of age on rations containing several feeds. In a second group of each breed, hominy feed replaced the corn in the mixed ration. White Rocks were slightly heavier at finishing, but there was little difference between the weights of crossbreds and Barred Rocks. Mortality was 21.7 percent in White Rocks and about 10 percent in each of the other breeds. Coccidiosis was minimized by milk treatment and frequent cleaning. If sufficient space and adequate feed are provided, it is concluded that broilers may be successfully raised during the summer months in complete confinement.

Off-season pullets, J. A. Davidson, C. M. McCrary, and C. G. Card (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 211-214*).—The egg production from October-hatched White Rock pullets was not satisfactory, but this does not mean that other breeds or varieties will give unfavorable results for production of off-season pullets or that the management procedure was unsound. During the 8 mo. of the test, 34 of 281 pullets died. More space and adequate equipment were needed for off-season production in Michigan's rigorous climate.

Poultry pastures favor pullets, G. F. Heuser and L. C. Norris. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 1, 17, illus. 1*).—The merits of pasture for poultry as a source of wide variety of nutrients, with the main limitation the inability of birds to utilize fiber, are pointed out. Good pastures save feed.

Feeding for egg production, B. Alder (*Utah Sta. Mimeog. Ser. No. 304 (1943), pp. 3*).—Examples of scratch feed and mash for laying hens which have given good results with and without corn are presented. Recommendations for cod-liver oil, scratch grain, and green feeding are also included.

Feeding of laying hens, P. J. Serfontein (*Farming in So. Africa, 18 (1943), No. 212, pp. 819-823*).—In an experiment with five different rations for lots of Single-Comb White Leghorn and Black Australorp hens it was found that decreases in nutritive value associated with changes in their composition promoted egg eating. Oat bran did not prevent feather eating. Small quantities of palm-kernel oil cake were included in the ration without deleterious effect.

Comparison of proso millet and yellow corn for feeding laying hens, G. P. Goodearl (*North Dakota Sta. Bul., 329 (1943), pp. 23*).—In 3 years' trials started each year with 180 White Leghorn pullets and 160 Rhode Island Red pullets, egg production with yellow corn in the scratch and mash averaged 162.8 and 159.0 eggs in the two breeds. When the yellow corn was replaced by proso millet the egg production of the respective breeds averaged 174.4 and 152.8 eggs. The proso millet was as acceptable and as readily consummed as yellow corn. The total feed consumption was somewhat greater by both breeds when the millet replaced the corn. Per dozen eggs produced, an average of 5.9 lb. of feed was required by the White Leghorns receiving proso millet, as contrasted with 6 lb. by Leghorns receiving yellow corn. With the yellow corn, the Rhode Island Reds consumed 7.2 lb. feed per dozen eggs produced, as contrasted with 7.7 lb. by those receiving proso millet. The results indicate that the replacement of proso millet for yellow corn did not affect egg size, mortality, or pullet weight in either breed, although hatchability of the fertile eggs in both breeds was definitely improved.

The feeding of raw and cooked potatoes and sugar beet to laying pullets, H. Temperton and F. J. Dudley (*Jour. Agr. Sci. [England], 33 (1943), No. 4, pp. 204-206*).—Cooked and raw potatoes and sugar beets were added to a control

ration of 6 lots of 20 reciprocally crossed Rhode Island Red and Light Sussex pullets, fed for 6 lunar mo. The egg production of two lots on the control ration averaged, respectively, 88.5 and 90.9, with raw and cooked potatoes 70.8 and 100.5, and with uncooked and steamed sugar beets 87.7 and 93.7. There was little difference in the final body weight of groups fed on the raw potatoes or sugar beets and the controls with mash only. Steaming the potatoes and sugar beets resulted in gains of about 0.5 lb. in body weight. A greater supplement of protein is required for sugar beets than for potatoes.

Observations on the mineral metabolism of pullets.—VII, The calcium requirement of the laying bird, R. H. COMMON (*Jour. Agr. Sci. [England], 33 (1943), No. 4, pp. 213-220, illus. 2*).—Continuing this series (E. S. R., 87, p. 409), evidence in calcium balances with hens showed that the average daily retention of calcium was about 50 percent for intakes of about 1 to 3.5 gm. of calcium. About 4 gm. of calcium daily was the requirement for hens in heavy egg production. The hypothesis that skeletal mobilization normally occurs in connection with shell formation is discussed.

Developing early-feathering strains in heavy breeds of poultry, D. C. WARREN (*Kansas Sta. Cir. 224 (1944), pp. 4, illus. 3*).—The early feathering characteristic is more easily recognized in the early chick stage than at broiler stages. Early feathering is a sex-linked character and is transmitted as a recessive from sire to daughter or dam to son. When roosters show early feathering they carry two genes for it, one of which is transmitted to the daughters.

Feeding experiments with ducks, P. J. SERFONTEIN (*Farming in So. Africa, 18 (1943), No. 212, pp. 807-818, illus. 4*).—Two groups of ducks, including 29 drakes and 26 ducks in each group, were fed to 10 weeks of age. Both groups received a complex mixture, with one lot having one-fifth of the ration replaced by twice as much finely cut green alfalfa from the fourth week. There was only a small difference in the weights up to 10 weeks of age. By giving the extra green feed there was a considerable saving in the feed consumed, but abnormalities such as crooked wings were not prevented. In another experiment feather picking, when 0, 10, and 25 percent oat bran was included in the ration, was investigated in 3 groups of 28 drakes and 34 ducks each. The rations of all lots included 5 percent brewers' yeast and 3 percent molasses. There was no feather eating in any of the lots to 10 weeks of age, but mortality was very heavy up to 2 weeks. A ration low in fiber is recommended during the growing period. In another experiment 3 groups of 35 drakes and an equal number of ducks were fed to 10 weeks of age. Flavin in brewers' yeast stimulated growth. Exclusion of molasses did not seriously interfere with the ducks because of the pantothenic acid content of brewers' yeast. In another experiment addition of manganese sulfate to a ration of 50 birds of each sex did not prevent the occurrence of crooked wings. Normal growth occurred with a ration low in manganese.

Turkey management, S. J. MARSDEN and J. H. MARTIN (*Danville, Ill.: Interstate, 1944, 2, ed., [rev.], pp. 752+, illus. 142*).—A revision of the book previously noted (E. S. R., 82, p. 808).

The national standard squab book, E. C. RICE (*Melrose, Mass.: Squab Pub. Co., 1944, 58. ed., [rev. and enl.], pp. 720, illus. 253*).—A revised and enlarged edition (E. S. R., 51, p. 177), containing Rice's Squab Primer (pp. 501-512) and miscellaneous articles on pigeon production by various authors.

DAIRY FARMING—DAIRYING

A 2 × 2 factorial design for double reversal feeding experiments, D. M. Seath. (La. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 2, pp. 159-164*).—A method of answering questions on the comparison of two roughages and two grains with limited numbers of cows by double-reversal feeding in the same trial is proposed. The method involves the analysis of variance by the *t* test. Examples presented are for significant differences in milk yield between Alyceclover and lespedeza and between corn and sweetpotato meal, with one-fourth cottonseed meal in each case, using 10 cows. Examples of nonsignificant differences are selected from live weight changes with these feds.

Water for the cows, C. Y. Cannon (*Farm. Sci. Rptr. [Iowa State Col.] 5 (1944), No. 2, pp. 14-15, illus. 1*).—In reversal tests of 28 days, groups of six cows watered by bowls beside them drank 18 percent more water and produced 3.5 percent more milk and 10.7 percent more butterfat than when they were watered twice daily at outdoor tanks.

Influence of quality of protein in the concentrate mixture on the milk production of dairy cows fed mixed hay and corn silage as roughage, R. W. Bratton (In *Cornell University Abstracts of Theses, 1942. Ithaca, N. Y.: Cornell Univ. Press, 1943, pp. 455-459*).—A simple concentrate mixture of corn gluten feed and corn gluten meal added to a mixture of equal parts ground corn and oats gave as good results in milk production and the maintenance of weight with cows on mixed (mostly nonlegume) hay and corn silage as when a high-quality protein concentrate of oats, corn, corn gluten feed, distillers' corn dried grains, soybean meal, linseed meal, and cottonseed meal was fed. To improve palatability, 5 percent cane molasses replaced an equal percentage of corn and oats. Satisfactory body weights and condition were maintained at no decrease in milk production. It is concluded that protein quality is of little importance for dairy cows on rations of common roughages and concentrates. The studies were conducted continuously for 13–20 weeks in each of 5 different years with a total of 43 cows on each of the experimental rations.

Ammoniated sugar beet pulp as a new nitrogenous feed for ruminants, H. C. Millar (*Jour. Dairy Sci., 27 (1944), No. 3, pp. 225-241, illus. 5*).—The results of an experiment of 225 days involving the growth of seven Holstein calves indicated that N from ammoniated sugar beet pulp can be utilized for their nutritional needs. The substitution of plain beet pulp for ammoniated beet pulp, molasses for starch, and starch and molasses for soybean meal was investigated.

Citrus molasses—a new feed, R. B. Becker, P. T. D. Arnold, G. K. Davis, and E. L. Fouts. (Fla. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 269-273*).—In studies of the palatability of citrus molasses, a byproduct of the citrus industry, 25 cows readily consumed daily 2 lb. each of a citrus molasses concentrate containing 5 and 10 percent of citrus molasses with other feeds. In another trial 26 of 34 Jersey and Guernsey cows at first refused straight citrus molasses, but by repeated offerings greater numbers of animals ate it. Some slight feed flavors, though not objectionable, were noted in milk from cows fed the citrus molasses 2 hr. before milking. The aroma and palatability of Napier grass silage were improved by including 2-4 percent of citrus molasses.

A comparison of Manamar and cottonseed meal in the ration of dairy cattle, C. M. McCrary and G. E. Taylor (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 178-181*).—Over a 5-yr. period there were no significant differences in health, growth, disease occurrence, milk or fat production, or reproduction in cows

receiving Manamar in place of cottonseed meal as a supplement to a ration of corn and oats. Results during the first year favored Manamar, but this was more than offset by the fifth year's results.

The relative feeding value of silages fed to dairy cows for milk production and to growing dairy heifers, N. P. Ralston (In *Cornell University Abstracts of Theses, 1942. Ithaca, N. Y.: Cornell Univ. Press, 1943, pp. 464-471*).—A continuous feeding trial for milk production, conducted for 14 weeks, showed that practically the same amounts of fat-corrected milk were produced by cows receiving corn silage, molasses legume silage, or phosphoric acid legume silage supplemented with calcium carbonate, and the cows maintained weights equally well.

In an experiment conducted by the double reversal method in periods of 8 weeks' duration with 1-week transition periods, approximately equal amounts of fat-corrected milk were produced by groups of seven cows on corn silage and by silage from a mixture of 60 percent alfalfa, 10 clover, 20 timothy, and 10 percent other grasses and weeds with 55 lb. of blackstrap molasses per ton of green forage. Approximately 1 lb. more total digestible nutrients and about 0.4 lb. more protein per day were consumed by cows receiving the molasses legume grass silage.

In a second trial by the single reversal method, conducted with two groups of nine cows, with feeding periods of 5 weeks' duration, considerable difficulty was experienced in getting the cows to eat the molasses legume silage, which was of only moderate quality. It was made from a mixture of 25 percent alfalfa, 30 clover, 30 timothy, and 15 percent other grasses and weeds. The general results from silage feeding indicated that a mixture of grasses and legumes must be ensiled before the late-bloom stage to produce a satisfactory grade of silage for milk production in dairy cows.

In tests of variable lengths, molasses soybean-Sudan grass silage and molasses soybean silage of good quality were equal to or slightly superior to corn silage for growing heifers. Time of harvesting was an important factor. Corn cut in the late dent stage for silage had a higher feeding value for heifers than when cut in the early dough stage.

High levels of vitamins A and D fed to dairy calves prove beneficial, E. A. Keyes (*Pennsylvania Sta. Bul. 446 (1944), Sup. 2, pp. 4-5, illus. 4*).—A more liberal feeding of vitamins A and D in calf starter meals was advantageous in producing strong healthy calves. Illness in calves of prepartum-milked cows was corrected by 1 week's feeding of carotene. However, calves of prepartum-milked cows on pasture were normal.

The milk and butterfat production responses to shark liver oil in the ration, F. C. Fountaine and D. W. Bolin. (Idaho Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 2, pp. 155-158, illus.* 1).—The daily feeding of 60 cc. of shark-liver oil to Holstein and Jersey cows had effect on the butterfat or milk production, but there did result a 280-305 percent increase in the vitamin A content of the milk fat. There were decreases of 22 and 33 percent in the carotene content of the Holstein and Jersey milk, respectively. The study was conducted with six Holstein and six Jersey cows over a 16-week period with half of them receiving shark-liver oil and the others kept as controls.

Acetonemia, a vitamin A deficiency, J. W. Patton (*Vet. Med. 39 (1944), No. 4, pp. 150-153*).—Acetonemia, which occurs in dairy cattle in practically all parts of the country, seems to respond promptly, with complete recovery, upon administration of vitamin A.

The comparative effects of continual and rotational systems of grazing on the carotene content of permanent pasture herbage and of the milk produced there-

from, J. H. Mitchell and G. H. Wise. (S. C. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 3, pp. 189-196, illus. 1*).—The total pasture area of 6 acres previously described by Elting et al. (E. S. R., 77, p. 688) was divided into thirds. One-third was continuously grazed; the other two were divided to form a four-unit system, rotationally grazed by Holstein, Jersey, and Guernsey lactating cows. In 3 yr. the entire pasture was included in permanent and rotational grazing. Samples of the herbage were collected twice each month from the continuously grazed pastures and four times each month from the rotational sections. Determination was made of the carotene in the herbage samples and in samples of milk collected biweekly from each of the three breeds. Fat analyses of the milk were also reported. Differences in the carotene content of the hergage and milk were not as great as differences in type of grazing resulting from seasonal changes in the flora. Variations in the carotene ingested were reflected in the carotene values of the milk during the spring and fall, but the relation did not hold true during the summer when the values of milk were evidently at a high level.

Vitamin-D deficiency in dairy cows: Symptoms, causes, and treatment, G. C. Wallis (*South Dakota Sta. Bul. 372 (1944), pp. 16, illus. 2*).—A general discussion is given of symptoms, causes, and cure for vitamin D deficiency in cows and calves. A study of breed differences in the recovery of vitamin D in the butterfat of three Holstein and three Jersey cows showed that about 1.5-1.75 percent of the amount present in the feed was in the butterfat of both breeds during the first part of the lactation period. The amount declined to about 0.5-0.75 percent as lactation advanced.

Live weight and milk-energy yield in British goats, E. E. Ormiston and W. L. Gaines. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 243-247, illus. 2*).—The average of the records of 318 goats in the 2-day milking competition over a 17-yr. period in the London Dairy Show was found to be 8.36 lb. of milk and 0.390 lb. of fat. The FCM milk yield ranged from 1.5 to 17.2 lb. per day, and live weight ranged from 88 to 250 lb., with a correlation of 0.57 between them. In the power equation regression, $FCM = aW^b$, $b = 0.91$. In well-developed goats, milk energy yield tended to be proportional to live weight since b in the above regression becomes essentially 1.

The influence of low environmental temperatures on intramammary temperatures, M. Cornejo, D. Espe, and C. Y. Cannon. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 3, pp. 181-188, illus. 1*).—The body, rectal, and teat canal temperatures of 19 normal cows and 11 with mastitis, or inoculated with it, were ascertained at environmental temperatures ranging from 70° to −14° F. The intramammary temperature was influenced by environmental temperature. During the coldest weather the intramammary temperature was over 5° below the rectal temperature. When the environmental temperature varied from 58° to 70° there was a difference of 2°–3°. Moving the cows into the barn and washing the udders probably decreased the actual difference between the udder and environmental temperatures.

The effect of machine milking upon the leucocyte count and the chloride content of milk, J. F. Cone. (U. S. D. A.). (*Jour. Dairy Sci., 27 (1944), No. 3, pp. 215-224*).—In a total of 2,883 samples of milk from the same cows milked by hand and by milking machines, higher leucocyte counts and chloride levels were found when milking machines were employed, but there were exceptions both in normal animals and those showing mastitis. The machine milking seemed to be a factor in the spread of *Pseudomonas aeruginosa,* but it was uncertain whether this was a factor in the spread of streptococci.

The effect of the interaction of casein and lactose on certain properties of milk and milk products, A. P. Stewart, Jr.. (In *Cornell University Abstracts of Theses, 1942. Ithaca, N. Y.: Cornell Univ. Press, 1943, pp. 472-475*).—Approximately 6 percent lactose, or its equivalent, was bound to casein when casein-lactose mixtures were heated at 100° C. for a sufficient time to form completely alkali insoluble symplexes. In the same way, insoluble material from a spray-dried milk powder held for a few days at high humidity and room temperature contained casein bound with 3.4 percent nonprotein material. Iodized, brominated, and nitrated casein did not react with lactose to form dark, insoluble lactose symplexes. Of significance is the determination that the 6 percent lactose bound to casein in these symplexes corresponds with the amount of formaldehyde on a molecular basis. The reactions of other groups of sugar and proteins were also studied in relation to browning. The reactions between lactose and casein can be inhibited by small amounts of chemicals.

Zinc in cows' milk, J. G. Archibald. (Mass. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 257-261*).—In a double-reversal test of 3 months' duration, it was found that adding a supplement of 10 gm. of zinc oxide per head daily to a ration of eight cows increased the zinc content of the milk from 3.9 mg. per liter to 5.1 mg.

Relationship of fat acidity to rancidity in homogenized raw milk, I. A. Gould. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 3, pp. 167-172, illus. 2*).—In agreement with the findings of Krukovsky and Herrington (E. S. R., 87, p. 414), a direct relationship was found between the development of rancidity in milk and the increase in acid degree of the fat, but the threshold value for the flavor was approximately twice as high on homogenized milk as reported for normal milk. Milk free of off-flavors and selected from the regular milk supply was homogenized at 700 lb. pressure at 37° C. Homogenized raw milk with acidity of fat within the range of 1.5 or 2.0 was usually rancid. Fat from rancid milk with acid degrees as high as 11.5 was not rancid, nor did it produce rancidity when homogenized into pasteurized skim milk. Free fatty acids in the butterfat were not responsible for the rancid flavor of dairy products. An oxidized or tallowy flavor rather than rancidity was produced in samples of skim milk in which 5 percent fat from homogenized and nonhomogenized milk was added during the homogenization process and examined organoleptically.

Solubility and volatility of fatty acids involved in lipolysis in homogenized raw milk, I. A. Gould and B. C. Johnson. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 3, pp. 173-180, illus. 2*).—Washing butterfat from homogenized milk with six successive portions of warm water did not appreciably affect the fat acidity. However, washing an ether solution of the fat with a weak alkaline solution is an efficient method of removing the free fatty acids. Recovery of volatile fatty acids by steam distillation of the butterfat was highly inefficient as only about 5 percent was recovered when the distillate volume was six times the original volume. Distillation of acidified alkaline washings of fat resulted in a recovery of approximately 32 percent of the free fatty acids. Free fatty acids in butterfat secured from homogenized raw milk by churning were apparently of the water-insoluble fat-soluble type.

Oxidized flavor in milk, XI-XIV. (W. Va. Expt. Sta.). (*Jour. Dairy Sci., 25 (1942), No. 12, pp. 1027-1039; 1041-1050; 27 (1944), No. 3, pp. 197-204, illus. 4; pp. 205-213*).—Continuing this series (E. S. R., 86, p. 825), four studies are reported:

XI. *Ascorbic acid, glutathione, and hydrogen peroxide as mechanisms for the*

production of oxidized flavor, F. C. Olson and W. C. Brown.—Washed cream from susceptible milk contaminated with 0, 0.5, 1, and 1.5 p. p. m. of copper did not develop oxidized flavor when stored for 3 days, but there was strong oxidized flavor when the following products were added per liter: 40-200 mg. of ascorbic acid, 105 mg. of glutathione, or 0.1 percent hydrogen peroxide. Additions of thiamine, pyridoxine, riboflavin, and cysteine in the presence of copper did not cause the development of the oxidized flavors.

XII. *Further studies of ascorbic acid mechanisms in the production of oxidized flavor in milk,* W. C. Brown and F. C. Olson.—The oxidized flavor development in washed cream treated with ascorbic acid and copper was prevented by 0.1 percent or more of potassium iodide, but lesser concentrations were ineffective. Pasteurization of the milk for 5 min. at 180° F. did not prevent oxidized flavor development. Dehydroascorbic acid produced the oxidized flavor in the washed cream treated with copper if it was properly buffered.

XIII. *Studies of cupric complexes of ascorbic acid and certain amino acids and their possible relationship to oxidized flavor development in milk,* F. C. Olson and W. C. Brown.—Investigation was made of copper complexes formed with ascorbic acid and comparison of the action of β-alanine with α-amino and β-amino acids. The development of oxidized flavor was closely associated with the ionization of copper and its destruction of ascorbic acid through the formation of a complex or direct compound with copper ions. Evidently anything which decreases ionization of copper retards the destruction of ascorbic acid and thus retards oxidized flavor development. Many individual factors have a bearing on the susceptibility or nonsusceptibility of milk to oxidized flavor development. The protective action of citric acid on the oxidizing action of copper ions with ascorbic acid is due to the formation of a copper complex with citric acid, thus removing copper ions from the reaction. Amino acids—glycine, glutamic acid, and alanine—were equally effective in forming complex ions. It appears that copper complexes are formed through the free amino group.

XIV. *A possible mode of action of inhibitors in preventing the development of oxidized flavor in milk,* F. C. Olson and W. C. Brown.—A number of substances normally occurring in milk, such as proteins, citrates, and lactose, act as inhibitors of oxidized flavor development. The proteins and the citrates form complexes with copper in washed cream, thus avoiding oxidized flavor development. Some substances inhibit the development of oxidized flavor by repressing the ionization of copper, like casein, Enzylac, and ascorbic acid; other substances, like tyrosine, divalent manganese, lactose, and glucose, inhibit oxidized flavor by being oxidized by hydrogen peroxide, thus protecting the phosphylipides of the milk.

Weed flavors in dairy products, J. R. Dice (*North Daktota Sta. Bimo. Bul., 6 (1944), No. 4, pp. 6-9*).—Attention is called to off-flavors in dairy products and the importance of stage of maturity of weeds in causing them. Onion flavor occurred in the milk 4-5 min. after the onions were eaten, and required 5-6 hr. after feeding for the flavor to disappear. French weed flavor and odor often does not disappear until 7-8 hr. after the weeds are eaten. Most cows will eat French weed that is growing with pasture grass or when pastures are short. Onion flavor was associated with the butterfat, but was not influenced by the amount of other feed. To avoid weed flavors in the milk, cows must be kept off weedy pastures 3-8 hr. before milking. Good pasture management helps control weeds, and the difficulty of off-flavor may be overcome by using one of several types of vacuum pasteurizers.

The function of the laboratory in the control of milk supplies, F. W. Fabian. (Mich. State Col.). (*Jour. Milk Technol., 6 (1943), No. 5, pp. 278-*

284).—Laboratory tests for determining the presence of pathogens for specific diseases, the plate counts, reduction by methylene blue and resazurin, phosphatase tests, and identification of thermoduric and coliform bacteria are reviewed. In spite of developments of laboratory tests, inspectors are deemed necessary to supplement and interpret laboratory findings.

A comparison of the roll-tube and standard plate methods of making bacterial counts of milk, C. C. PROUTY, H. A. BENDIXEN, and S. P. SWENSON. (Wash. Expt. Sta.). (*Jour. Milk Technol., 7 (1944), No. 1, pp. 5-16, illus. 3*).—Variances in bacterial counts of milk made by the plate and roll-tube methods were about equal, but there were certain advantages in the roll-tube method, involving less breakage of tubes, less storage space needed for them, and greater facility in handling than were obtained with petri dishes. On the other hand, special equipment was required.

Dairy equipment must be free from microbial contamination, W. L. MALLMANN. (Mich. State Col.). (*Milk Plant Mo., 33 (1944), No. 2, pp. 23-25*).—Heat at 150° F. was effective in killing 100 per cent of streptococci in 1 min, or more, but heat was unsatisfactory on the farm because water was usually not hotter than 120°-130°. For the production of quality milk one must have proper disinfection and cleaning of the utensils as well as sterilization.

A ropy milk outbreak caused by a thermoduric micrococcus, C. C. PROUTY. (Wash. Expt. Sta.). (*Jour. Milk Technol., 6 (1943), No. 5, pp. 263-265*).—In a study of ropy milk from a commercial pasteurization plant the source of contamination was traced to an organism closely related to *Micrococcus freudenreichii* in milk from one dairy. The organism rapidly produced ropiness with the development of an abnormal flavor and odor and active digestion of the curd. The organism withstood 143° F. for 25-35 min.

The nitrogen distribution in dried milk, U. S. ASHWORTH and H. O. VAN ORDEN. (Wash. Expt. Sta.). (*Jour. Milk Technol., 6 (1943), No. 5, pp. 272-273*).—The N distribution in about 32 samples of dried milk was ascertained as casein N 90.75 percent and noncasein N (before heat) 9.25 percent. Lesser amounts of other forms of N were present.

Action of butter cultures in butter: A review, F. J. BABEL and B. W. HAMMER. (Iowa Expt. Sta.). (*Jowr. Dairy Sci., 27 (1944), No. 2, pp. 79-141*).—A review of the additions of butter cultures to cream before churning and to sweet and salted butter and their effects on flavor and the prevention of certain bacterial defects. The review continues study of the effects of acethylethylcarbinol and related compounds on the flavor of the butter. Attention is given to the influence of additions of citric acid, aeration of cream, neutralization, metallic salts, and the washing of butter on its flavor, qualities, and storage. There is included an extensive bibliography.

Heat resistant coliform organisms, with particular reference to butter, H. F. LONG, T. I. HEDRICK, and B. W. HAMMER. (Iowa Expt. Sta.). (*Jour. Milk Technol., 7 (1944), No. 1, pp. 20-25*).—Of 116 heat-resistant *Escherichia* cultures isolated from butter, 63.8 percent survived 20 min., 41.4 percent 30 min., and 24.1 percent 40 min. at 61.7° C., and appreciable numbers of cells still were present after 50 min. Heat-resistant *Aerobacter* cultures were not encountered.

The iron content of butter and its relation to the butter wash water, J. B. LINNEBOE (*Sci. Agr., 24 (1943), No. 2, pp. 64-69*).—There were found to be differences in the Fe content of butter from different creameries, a range of 0.4 to 3.3 p. p. m. being observed in 146 churnings from 27 creameries. In 23 churnings

below first grade, 48 percent contained less than 1.5 p. p. m. of Fe. The Fe content of the butter wash water was found to affect the Fe content of the butter. All of the first-grade butter washed with distilled water or natural water low in Fe contained less than 1.0 p. p. m. of Fe.

Cultured buttermilk and acidophilus milk, C. LEATHERMAN and G. H. WILSTER (*Oregon Sta. Tech. Bul. 5 (1944), pp. 12, illus. 5*).—Methods for the preparation of cultured buttermilk from skim milk are described. The cooled pasteurized skim milk should be inoculated with the starter previously described (E. S. R., 85, p. 245) and incubated at 71° F. for 14-16 hr., following which it is cooled and cream added, with churning to produce butter granules. Bulgarian milk produced by *Lactobacillus bulgaricus* has a sharp acid and objectionable flavor and is definitely unpalatable. Acidophilus milk is produced by inoculating sterilized skim milk with a pure culture of *L. acidophilus*. The culture is prepared from a high quality skim milk sterilized by heating to a temperature of about 249.8° and cooling to 100° before inoculation. It is incubated at about 98.6° for about 36 hr. Storage may be at room temperature for not exceeding 14 days. Buttermilk or acidophilus milk may be flavored with orange juice, lemon juice, or apple cider.

Some causes of slow production of acid during cheesemaking, G. H. WILSTER. (Oreg. State Col.). (*Natl. Butter and Cheese Jour., 35 (1944), No. 3, pp. 10-12, illus. 4*).—Slow starters in cheese manufacturing may be due to phage activity, which may be controlled by meticulous care and destruction of air-borne phages with disinfection in the spray form.

Technical literature of ice cream for 1943. A LEIGHTON. (U. S. D. A.). (*Ice Cream Rev., 27 (1944), No. 9, pp. 26, 66-72*).—A review and classified bibliography of 175 researches relating to methods of ice cream production published in 1943.

VETERINARY MEDICINE

Bacteriological observations on the air of occupied premises.—I, Air disinfection with hypochlorites: A simple practical method of disinfecting the air of occupied premises, S. W. CHALLINOR (*Jour. Hyg. [London], 43 (1943), No. 1, pp. 16-54, illus. 4*).—These investigations have shown that repeated spraying of the air of an occupied room with 1 percent hypochlorite solution from a flit gun materially reduces the bacterial content of the air.

Purification and antibacterial activity of fumigacin and clavacin, S. A. WAKSMAN. (N. J. Expt. Stas.). (*Science, 99 (1944), No. 2568, pp. 220-221*).—This is a brief summary of results thus far obtained in clarifying prevailing confusion in the characterization of these compounds.

Studies on virus immunity: Experiments with the viruses of rabies and equine encephalomyelitis, U. FRIEDEMANN, A. HOLLANDER, and S. BORNSTEIN (*Jour. Immunol., 48 (1944), No. 4, pp. 247-257*).—The antibody contents of the immune serums were determined by injecting a mixture of a constant dose of virus and varying doses of immune serum into the intraventricular space of guinea pigs. These experiments were designated as direct tests and the minimal neutralizing doses of immune serum as Ad. The capacity of the immune serums to confer passive immunity was measured by injecting the same dose of virus into the intraventricular space and varying doses of immune serum intravenously. These experiments were designated as indirect tests and the minimal neutralizing doses of immune serum as Ai. The ratio $\frac{Ai}{Ad}$ was found to be at least 1,280 for the virus of

rabies and approximately 10 for the virus of equine encephalomyelitis. In the case of the virus of equine encephalomyelitis, Ad is the same for nonincubated mixtures and mixtures incubated for 20 hr. at room temperature. In the case of the virus of rabies, Ad is considerably lower for incubated mixtures. The virus of equine encephalomyelitis and its antibody do not combine in vitro once the immune serum is diluted to more than 1 : 4. On the other hand, the virus of rabies and its antibody combine in vitro even if the immune serum is highly diluted.

Fatal encephalitis in man due to the Venezuelan virus of equine encephalomyelitis in Trinidad, R. RANDALL and J. W. MILLS (*Science, 99 (1944), No. 2568, pp. 225-226*).—This report of what is believed to have been the first outbreak of equine encephalomyelitis in Trinidad, involving approximately 70 cases among horses and mules, is said to record "the first instance in which the Venezuelan strain of equine encephalomyelitis virus has been proven to occur naturally in man, producing a fatal infection. Further, it establishes the fact that all three strains of equine encephalomyelitis viruses known to be present in the Western Hemisphere are capable of producing a fatal encephalitis in man."

The action of Penicillium extracts in experimental tuberculosis, M. I. SMITH and E. W. EMMART (*Pub. Health Rpts. [U. S.], 59 (1944), No. 13, pp. 417-423*).—Several *Penicillium* antibiotics were examined for their bacteriostatic action against the tubercle bacillus in vitro, for their inhibiting action of tubercle formation on the corioallantoic membrane of the chick embryo, and for their chemotherapeutic effectiveness in experimental guinea pig tuberculosis.

Penicillin and penatin were ineffective in inhibiting the growth of the tubercle bacillus in vitro. Aqueous solutions of ether extracts of Raulin-Thom culture media of *P. notatum* exhibited in vitro marked activity at certain concentrations, while similar extracts of *P. cyclopium* showed none. All preparations tested appeared to have some activity in reducing the extent of tubercle formation on the chorioallantoic membrane without effecting a reduction in the incidence of infection. Penicillin (Florey) and extracts of culture media of *P. cyclopium* exhibited no effect on experimental tuberculosis in guinea pigs. A slightly favorable effect was obtained with extracts of Raulin-Thom culture media of *P. notatum.*

Carrier cattle as a source of infective material for horsefly transmission of anaplasmosis, J. C. LOTZE. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 164-165*).—In attempts to transmit experimentally *Anaplasma marginale* from carrier cattle with a horsefly, *Tabanus sulcifrons* Macquart, negative results were obtained in four cases when the source of the infective material consisted of three animals which were infected for as long as as 11 to 17 mo. and in which anaplasms were not demonstrable in the blood by microscopic examination. Positive results were obtained in two attempts to transmit anaplasmosis with the same species of horsefly when anaplasms were microscopically demonstrable in the blood of a carrier animal during a mild subclinical relapse which occurred approximately 11 mo. after this host had been experimentally infected.

Johne's disease and johnin reactions, E. P. JOHNSON and A. D. PRATT. (Va. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 117–124, illus. 7*).—The data presented include records of feeding, breeding, milk production, viability of calves, periodically repeated johnin tests, and autopsy findings on purebred Holstein-Friesian cattle removed, because of johnin reactions, from a herd in which there had been no clinical case of Johne's disease.

Six of the mature animals either died or were killed. Three of these had intestinal lesions suggestive of Johne's disease, and acidfast organisms were found in these lesions from two. Two others in this group and one in another

herd under observation developed skin nodules that contained acidfast organisms suggestive of *Mycobacterium paratuberculosis.* Repeated johnin tests on these seemed to elicit a degree of reaction closely parallel to the increase in size and number of nodules present. Intradermal johnin from the same lot produced positive reactions in animals from four other herds that were affected with Johne's disease.

The findings recorded indicate that "two or three types of infection may be responsible for the reactions to the test: (1) Where active infection of the organism occurs in the intestines of susceptible animals sufficiently severe to bring about symptoms of the disease; (2) where a less virulent organism is present in mature and comparatively more resistant animals that may bring about slight intestinal lesions but not sufficient to produce clinical symptoms; and (3) where skin infections occur of sufficient degree to sensitize the animal to the test, but when removed the sensitivity is lost. A reaction elicited in a calf after being in contact with these animals indicates that occasionally animals in the last two groups may be spreaders of the infection."

Two splenectomized hamsters fed *M. paratuberculosis* gave a reaction to the johnin test but no other evidence of the disease. Cats fed the organism also reacted to the test, and in two instances lesions were found in the intestines that were suggestive of Johne's disease.

Studies on johnin, III, IV (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 179-188, illus. 4; pp. 189-192, illus. 4*).—A continuation of this series (E. S. R., 87, p. 711).

III. *Multiple testing on sensitized cattle as a method of studying johnin potency,* H. W. Johnson (U. S. D. A.).—A study was made of the possibility of using cattle as test animals. The cattle were highly sensitized by intraperitoneal injections of *Mycobacterium paratuberculosis* suspended in mineral oil. All areas of the skin showed a uniform and satisfactory sensitivity.

One hundred or more intradermic tests were run simultaneously on the same sensitized animal with satisfactory results. The double intradermic method of testing failed to show any advantage over the single intradermic method employing 0.2 cc. injections. It was found that millimeter readings of increases in skin thickness resulting from intradermic tests will not always detect differences of less than 75 percent.

By using serial tenfold dilutions of lots of johnins, potency relationships were determined. Sensitized cattle could be retested at intervals of 1 mo.

In the author's opinion, "the multiple testing method on sensitized cattle promises to be a very decided improvement over existing methods of comparative testing of lots of johnin or for comparative testing of johnin with other allergins."

IV. *Dermal thickness gage,* F. A. Kummer and H. W. Johnson (Ala. Expt. Sta. and U. S. D. A.).—A uniform pressure device which provides identical measurements by eliminating individual errors made by different operators is illustrated and described.

The resazurin and rapid resazurin tests, I-III, J. G. Davis, L. G. Newland, and P. B. Knuckey (*Dairy Indus., 8 (1943), Nos. 1, pp. 23-29, illus. 12; 2, pp. 71-77, illus. 30; 3, pp. 115-119*).—This is a comparison of methods in their relation to other bacteriological tests and mastitis.

The use of sulfathalidine (phthalysulfathiazole) in the control of diarrhea of new-born dairy calves, G. H. Wise and G. W. Anderson (*South Carolina Sta. Rpt. 1943, pp. 70-73, illus. 2*).—In the Clemson dairy herd the mortality over a 15-mo. period preceding the use of sulfa drugs was 71.4 percent of all infected animals. Of 38 calves receiving sulfathalidine as a preventive,

89.5 percent were protected. In 23 cases of the disease so treated, only 4 died.

Scours in Oregon calves, O. H. Muth and J. N. Shaw (*Oregon Sta. Cir. 154 (1943), pp. 10, illus. 2*).—This is a discussion of the nature and treatment of white scours, coccidiosis or bloody scours, and worms or black scours.

Further biochemical studies of pregnancy toxaemia in sheep, E. J. Underwood, D. H. Curnow, and F. L. Shier (*Austral. Vet. Jour., 19 (1943), No. 6, pp. 164-173*).—The results of determinations of blood glucose, serum calcium, liver glycogen, and liver vitamin A levels of a series of ewes affected with pregnancy toxemia and their fetuses and a number of poorly fed and fairly well-fed healthy ewes and their fetuses, killed during the last few weeks of pregnancy, are described.

It is considered that the disease is intimately associated with, if not caused by, a disturbed carbohydrate metabolism due to the combination of a low caloric intake and high demand as in late pregnancy, and that it can be completely prevented by providing a diet capable of consistently maintaining live weight increases in the ewe during the last 2 mo. of pregnancy.

Survival on grass plots of eggs and larvae of the stomach worm, Haemonchus contortus, D. A. Shorb. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 8, pp. 317-324*).—Experiments were conducted from August 1936 to March 1938 at the U. S. D. A. Beltsville Research Center to determine how long eggs and larvae of the large stomach worm (*H. contortus*) would survive under outdoor conditions during different seasons of the year. Feces of sheep infected with the parasite were placed on 2-ft.-square grass plats in August and October. During the fall and winter, infective larvae were recovered from the plats, but in much smaller numbers than during the summer or early fall. In each of three tests continued until spring the number of larvae recovered in March was higher than in the preceding month. This result probably was due to larvae being attracted to the surface of the soil by rising temperatures. A few infective larvae exposed on grass plats in August or October survived until the following spring, but all larvae surviving until April or May were sluggish and vacuolated and probably noninfective.

These findings indicate that pastures kept free of sheep from October until the middle of April will contain only a few larvae of *H. contortus* still capable of infecting these host animals.

Effects of environment upon the free-living stages of Ostertagia circumcincta (Stadelmann) (Trichostrongylidae).—II. Field experiments. D. F. Furman. (Univ. Calif.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 147-153, illus. 3*).—Field experiments directly correlated with previous work (E. S. R., 90, p. 828) were conducted to ascertain the effects of pasture type and pasture management upon the longevity and availability of the free-living stages of the parasite.

It was found that free-living stages of *O. circumcincta* can develop in large numbers from the egg stage to the infective larval stage during the summer months on irrigated California pastures, and that infective larvae on such pastures can survive the entire summer season. On nonirrigated land all free-living stages are rapidly killed in the summer. This indicates that irrigated pastures left idle throughout the summer must still be considered as potential foci of infection. Irrigated Ladino clover is more favorable for the development and survival of the free-living stages of *O. circumcincta* in the summer than irrigated alfalfa or ryegrass. During the fall and winter months a much greater percentage of eggs develop to the infective larval stage than in the summer. Irrigated heavy soil is

more favorable for longevity of infective larvae in the summer than irrigated light soil. Following comparable infestations, a greater number of infective larvae is found on the upper foliage of Ladino clover than on alfalfa and more on the upper foliage of alfalfa than on western ryegrass. This is correlated with the type of external plant morphology.

It is concluded that the increased incidence of *O. circumcincta* in California sheep during fall and winter months is largely due to the increased numbers and availability of infective largae at these periods. "For the same reason, a higher summer incidence of infection with *O. circumcincta* may be expected in sheep grazing on irrigated pasture rather than on nonirrigated pasture."

Phenothiazine-salt mix prevents parasite infestations of sheep, W. T. S. THORP (*Pennsylvania Sta. Bul. 446 (1944), Sup. 2, pp. 5, 9, illus. 2*).—A 1 : 9 mixture of phenothiazine and salt was found the most efficient of several methods of using this anthelmintic. No toxicity or anemia was produced in ewes after 21 mo. of continuous treatment.

Some observations on experimental infections of pigs with the thornheaded worm Macracanthorhynchus hirudinaceus, K. C. KATES. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 166-172, illus. 2*).—Detailed results of this investigation, already noted in part (E. S. R., 86, p. 827), are tabulated and discussed.

The prepatent period of the swine thorn-headed worm has been calculated to be from 2 to 3 mo. The maximum duration of the patent period was approximately 10 mo. The estimated average maximum daily egg production per female was approximately 260,000. Gravid female specimens contained at one time as many as 10,000,000 embryonated eggs and apparently still retained the potentiality of producing many more. The majority of the parasites were localized in the jejunum, 23 ft. to 43 ft. from the pylorus, but some occasionally became attached somewhat posterior to this region. Characteristic nodules were formed at the site of attachment of the parasites to the wall of the small intestine. The observations indicate that these worms may sometimes change their position of attachment, forming new nodules. After the parasite is released from a nodule, resolution of the lesion takes place. The number of worms of each sex recovered from the experimental pigs was approximately equal. The female specimens varied in size from 21.6 to 45.7 cm.; the males from 5.3 to 10.8 m. Seven female parasites and one male were spontaneously eliminated from the pigs during the course of the experiment. The probable causes of this phenomenon are discussed.

The status of hydrogen peroxide as an anthelmintic in dogs, F. D. ENZIE. (U. S. D. A.). (*Vet. Med., 38 (1943), No. 8, pp. 302-304, illus. 2*).—Tests by the author with hydrogen peroxide "do not confirm the opinion that this is a superior anthelmintic. It appears to lack a satisfactory degree of safety and is not more effective than other anthelmintics that are currently employed for the removal of intestinal helminths from dogs."

The pathology of experimental avian pneumoencephalitis, E. JUNGHERR and E. L. MINARD. ([Conn.] Storrs Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 125-134, illus. 18*).—To establish a microscopic basis for the differential diagnosis between avian pneumoencephalitis (P. E.) and avian encephalomyelitis (A. E.), the histopathology of 31 P. E.-inoculated chicks and 12 embryos was studied and compared with a series of 40 A. E.-infected chicks. The P. E. virus was obtained from California, one strain derived from chicks, another from a pullet diseaselike condition in adult birds. "Both strains caused typical P. E., but thus far the pullet disease syndrome observed in the Northeastern

The histopathology of P. E. was characterized by catarrhal tracheitis and bronchitis, infiltrative sacculitis of the pulmonary air sacs, and hemorrhages and/or hyaline necrosis in the adenoid sheaths of the spleen. Occasionally, the central nervous system showed small areas of capillary hemorrhages, myelin degeneration, and localized foci of meningitis; and in the majority of the cases, marked endothelial hyperplasia, severe vacuolar to coarse fibrillar degeneration of the large neurons (a form of peripheral neuritis), and numerous scattered glia foci composed primarily of protoplasmic astrocytes with hypertrophic processes. The glia foci were at times associated with perivascular infiltrates. The central nervous system lesions occurred particularly in the cord, the brain stem, and adjacent structures. In one instance, specific lesions were observed in the spinal cord of an inoculated chick embryo.

As compared with A. E., P. E. failed to show the hyperplasia of the lymph follicles in the visceral organs, the axonal reaction of central neuritis of the large neurons, and the predominance of perivascular granulomatous foci in the central nervous system.

It is concluded that avian pneumoencephalitis is of a pantropic character, that it causes a typical encephalomyelitic process, and that it constitutes a pathologic as well as an etiologic entity.

Neutralization tests with avian pneumoencephalitis virus, E. L. Minard and E. Jungherr. ([Conn.] Storrs Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 154-157*).—In connection with the studies noted above, serum samples obtained from these experimental birds before inoculation were held for subsequent neutralization tests and found to have a surprisingly high titer against P. E. virus.

A method was developed for the quantitative neutralization test with P. E. virus in 8- to 10-day-old chick embryos. The test gave fairly sharp and reproducible results. Fifty-four chickens, 32 presumably healthy and 22 affected with various diseases, representing ages from 3 to 24 mo. and various breeds, were tested for P. E. neutralizing antibodies. Of these birds, 29 came from outside the university flock, namely, 22 from the New England States, 2 each from Michigan and California, and 1 each from New York, New Jersey, and Iowa. All birds but 1 (96 percent) showed fewer than 100 neutralizing doses. Of 25 birds from the university flock, 17 showed over 100 neutralizing doses ranging from 10,000 to 1,000,000. There was no record of spontaneous occurrence of P. E. in the university flock.

In limited experiments, parallel titration of serum samples in chicks and embryos gave comparable results. Preservation of serum samples with 1 : 10,000 Merthiolate and their storage for 1 mo. did not decrease the neutralization titer.

Avian leukosis and lymphomatosis, A. M. Lee, L. H. Scrivner, and M. O. North (*Wyoming Sta. Bul. 226 (1944), pp. 32*).—Following a discussion of nomenclature, economic importance, cause, symptoms, lesions, and problems, the method of approach and the results are given for 4 yr. of experimental work upon this disease complex. A total of 753 birds were used, divided into 25 pens.

When laying pullets were exposed to birds which had the avian leucosis complex, wheat germ oil supplied no protection for the noninfected birds when it was fed as a supplement to a normal laying diet or when it was fed as a supplement to a diet low in vitamin E. By inoculating 5-month-old pullets intraperitoneally with suspension material from the blood, liver, spleen, eyes, and nerves of infected birds, it was possible to transmit the complex. Chicks were more susceptible to inoculations when a few days to a few weeks of age than when older, indicating

that most of the infection may be transmitted when the chicks are very young. Inoculated chicks were capable of transmitting the disease to other noninoculated chicks which were housed in the same pen. Noninoculated chicks kept in nearby separate pens were not affected. Oral infection as a supplement in inoculation did not produce a higher incidence of the disease than inoculation alone. When the inoculations of leucotic material were made at a young age the disease appeared only after several months, generally after laying commenced but sometimes before.

Susceptibility to infection by contact and by injections varied greatly and appeared to be greatest at a few days of age and to decrease gradually to adult age, at which time birds were only very slightly susceptible.

The source of material, either from neural, ocular, visceral, or erythroleucotic cases, was no indication as to the type of disease which was produced in the inoculated birds. Any one or all of the four types of the disease were produced from material of any single type.

Simplified control of fowl leukosis, F. B. Hutt. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 11, 13*).—From 40 to 50 percent of the high mortality in pullets during the first laying year was reduced by brooding, during the first 2 weeks after hatching, at some distance from adult fowls. Mortality was as much as 30 percent in a susceptible strain in a brooder house not far distant from adults, but only 16 percent in a strain of birds in a more isolated brooder house. Mortality was correspondingly different in two resistant strains.

Infectious laryngotracheitis, F. R. Beaudette and C. B. Hudson (*New Jersey Stas. Hints to Poultrymen, 3 (1943-44), No. 2, pp. [4]*).—A popular discussion of this disease and its treatment.

Comparison of crystal violet antigen, thiosulfate antigen, and the tube method in testing pullorum serums, R. H. Linn, W. H. Leask, M. F. Gunderson, and J. M. Slack. (Univ. Nebr.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 158-163, illus. 8*).—Charts are presented showing reactions with a number of *Salmonella* strains in a test of methods.

It was found that the thiosulfate antigen is less sensitive than the crystal violet antigen, though not enough so to eliminate cross reactions which might be expected to result from infections with any one of these organisms. The crystal violet antigen will detect titers of 1 : 10 in the majority of cases. "Sandy" or "doubtful" reactions are the result of a low concentration of pullorum agglutinins in the blood tested and should be regarded as probably indicating either an old quiescent infection or a very recent one.

Treatment of a virus disease of chickens with sulphonamides, F. D. Asplin (*Nature [London], 153 (1944), No. 3878, p. 253*).—A disease produced by intraperitoneal inoculation of young chicks with strains of virus which originated from paralyzed fowls is described as resulting in the production of lesions which are necrotic and are most conspicuous in the liver and heart. Visceral lesions become visible to the naked eye 48-72 hr. after inoculation, increase in extent, and frequently reach maximum severity 6–8 days after infection. The disease is sensitive to treatment with most of the sulfonamides in common use, the value in descending order being sulfadiazine, sulfamezathine, sulfathiazole, sulfapyridine, and sulfaguanidine. Their action appeared to be similar to that in bacterial infections.

Influence of vitamins and coliform bacteria on sulfaguanidine tolerance by young chickens, K. H. Lewis, W. E. Ham, and W. I. Jensen. (Nebr. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 52 (1943) No. 1, pp. 33-35*).—

Baby chicks fed an adequate ration plus sulfaguanidine at the level of 1 gm. body weight per day had a death rate less than half that occurring when a mixture of *p*-aminobenzoic acid, thiamine, and riboflavin or a suspension of *Escherichia coli* was administered with the drug.

"These facts, together with the tendency of both the vitamins and bacterial suspension to sustain the coliform bacteria in the feces in the presence of an inhibitory concentration of the drug, suggest that the tolerance of sulfaguanidine by young birds may be related to the activities of the coliform bacteria in the intestinal tract. Our findings do not, in themselves, constitute a contraindication to the clinical use of sulfaguanidine, for the level of drug employed here is much in excess of the effective therapeutic dosage. They serve only to emphasize the apparently fundamental and complex relationship of vitamins and intestinal bacteria to the action of sulfaguanidine in vivo."

Egg-yolk medium or the cultivation of Hemophilus gallinarum, C. H. CUNNINGHAM and H. O. STUART. (R. I. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 142-146*).—This report is presented as the first on the use of an egg medium for the cultivation of *H. gallinarum.* It was found that egg yolk nutrient agar slants containing 0.8 percent sodium chloride with physiological saline at the bases of the slants provide a satisfactory, easily prepared, and blood-free medium for this purpose. Several hundred egg yolk agar slants, all of which were sterile, have been prepared, as contamination of this medium is reduced to a minimum with aseptic technic.

Removal of the cecal worm Heterakis gallinae from chickens by feeding phenothiazine in the mash, L. OLIVIER, R. W. ALLEN, and A. B. HARDCASTLE. (U. S. D. A.). (*Vet. Med., 38 (1943), No. 10, pp. 384-386*).—Three experiments involving 44 adult Rhode Island Red chickens were conducted to determine the efficacy of phenothiazine for the removal of *H. gallinae* when the drug was administered in the mash.

It is concluded that "the data show that group treatment of chickens for the removal of cecal worms by means of phenothiazine incorporated with mash is a practical procedure, and that an intake of about 0.5 to 1.0 gm. of the drug in mash over a period of 6½ to 7½ hr. removed most of the cecal worms. Phenothiazine, as used in these experiments, did not affect the appearance and weight of the birds and was, therefore, apparently harmless."

A protozoon of the genus Tetrahymena found in domestic fowl, D. R. KNIGHT and H. C. MCDOUGLE. (Mo. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 15, pp. 113-116, illus. 5*).—Microscopic examination of material from eight White Plymouth Rock cockerels 9 weeks of age and grossly appearing to be suffering from a vitamin A deficiency revealed an enormous number of active ciliates identified as Tetrahymena and believed to be associated with vitamin A deficiency.

Some questions and answers about "worms" in chickens and turkeys, E. M. DICKINSON (*Oregon Sta. Cir. 150 (1943), pp. 10, illus. 4*).—This circular consists of answers to 33 questions.

AGRICULTURAL ENGINEERING

The logistics of wartime food production, S. P. LYLE. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 4, pp. 122, 124*).—This is a general discussion of the engineer's function in wartime agriculture and in the readjustment to conditions expected to follow the war.

[Water resources survey] (*U. S. Geol. Survey, Water Resources Rev. U. S. and Canada, 1943-44, Oct.-Mar., pp. 11+, illus. 1*).—This issue covers the period October 1, 1943-March 31, 1944, and includes an appendix on the water content of snow and the prospective runoff for the United States and Canada.

Wasatch front irrigation resources, O. W. Israelsen (*Utah Farm and Home Sci. [Utah Sta.], 5 (1944), No. 1, pp. 5, 10-11, illus. 4*).—In the Jordan River-Utah Lake drainage area, although several storage reservoirs have been completed and a substantial percentage of the flood waters appropriated and stored for irrigation, city water supplies, and industrial uses, additional storage of water in surface reservoirs to the fullest extent practical, and in underground reservoirs, for use in this area is held to be of vital importance. Evaporation losses from Utah Lake are high. The annual irrigation water yield can be greatly increased by construction of a dike to reduce the lake area. If such development be supported by intelligent public opinion, there are opportunities for development and extended use of ground water in the Jordan Valley.

The Weber and Bear Rivers flowing into Great Salt Lake wasted into that agriculturally useless reservoir average annual volumes of 463,000 and 903,000 acre-ft., respectively, during the period 1918 to 1941. The need for storage reservoirs of more than this average capacity to conserve at least some of the waters of years of heavy runoff is emphasized.

Utah cooperative snow surveys and water supply forecasts, 1944, G. D. Clyde. (Coop. U. S. D. A. et al.). (*Utah Sta. Mimeog. Ser. No. 307 (1944), pp. [29]*).—A continuation (E. S. R., 89, p. 289).

A postwar program for irrigated land expansion, J. W. Haw (*Agr. Engin., 25 (1944), No. 4, pp. 142, 144, illus. 2*).—The author points out that reconnaissance and engineering investigation, principally by the U. S. Bureau of Reclamation, has disclosed the existence of feasible projects which would add about 20 million irrigable acres to the farming area of the 17 Western States. These projects refer to land with good soil and suitable topography and for which an adequate irrigation water supply can be provided at a cost which can be repaid by the water users on the usual terms after just and equitable allowance for subsidiary benefits. Out of the aggregate of such projects it can be safely assumed that 50 percent are highly desirable and that the required engineering data are now available or could be made available in a relatively short time. The author therefore proposes a program for the construction of multipurpose reclamation projects, with the irrigation of 10 million acres as the predominant objective. Development of this additional area of productive land will be needed, in the author's opinion, immediately after the war, both for its product and to furnish new employment capable of repaying its cost. Ten important reasons for the immediate planning of this post-war development are advanced and discussed.

A simplified solution for equivalent pipes, Q. B. Graves. (*Civ. Engin., 14 (1944), No. 2, pp. 71-72, illus. 1*).—The author reduces the Manning formula for flow to the form $H = KQ^2$, in which $K = \frac{23{,}100\, n^2 L}{d^{16/3}}$; H = head lost, in feet; Q = rate of flow, in thousands of gallons per minute; L = length of pipe, in thousands of feet; and n = roughness coefficient.

Values of K per 1,000 ft. of pipe can then be obtained from a table accompanying the article. Taking the proper value from K from this table for given values of n, D, L, and Q, the loss of head can easily be computed. For pipes in series, the values of K for the several sections are determined individually and then simply added together arithmetically to obtain the equivalent value of K for the

series. For the equivalent of pipes in parallel, the author proceeds to show, in a new solution, that

$$H = \left(\frac{1}{\Sigma \frac{1}{\sqrt{K}}} \right)^2 Q^2.$$

Nomographic chart for flow in pipes partly full, H. M. Gifft. (Cornell Univ.). (*Civ. Engin., 14 (1944), No. 3, pp. 115-116, illus. 2*).—The author developed an alinement chart or nonograph for the Manning formula. He notes, however, that "any comparable formula would give equally good results." The mathematical manipulations upon which the nomograph is based are briefly discussed and three examples of its use are worked. It is noted that slightly different results will be obtained by using the usual diagrams expressing the hydraulic elements in terms of the corresponding depth of flow. In view of the inaccuracies connected with the use of the open-channel flow formula itself, it is believed that these discrepancies are of no practical significance.

Similar charts can be constructed for sections other than circular by providing double scales for velocity and depth, one pair of V and D scales to apply for full flows and the other pair to apply when the section is only partly full.

Drainage doubles yields on Maryland's Eastern Shore, R. E. Uhland (*U. S. Dept. Agr., Soil Conserv., 9 (1944), No. 10, pp. 221-223, 231, illus. 4*).—With wartime demands for increased food production proper drainage was found to result in greatly increased crop yields. Corn yields on 17 farms in Caroline County, Md., were increased from 19.6 to 42.9 bu. per acre after drainage. Other crops showed similar increases in yield. The author points out that experience has shown that an expenditure of from $10 to $30 per acre for drainage will raise the productivity of ordinary farm crops enough to pay the cost in one or two crops.

Erosion control on slopes steeper than 12 per cent, E. G. Welch. (Univ. Ky.). (*Agr. Engin., 25 (1944), No. 4, pp. 123-124, illus. 1*).—The author here takes up the erosion control measures found necessary in an area largely composed of steep hills with a slope of from 20 to 25 percent, V-shaped valleys, and narrow ridges. About 12 percent of the area has a slope of 10 per cent or less. In general, the farms are too small to provide, from the forage-livestock type of farming, an income sufficient to maintain prevent living standards. Tobacco is produced as a cash crop. Only about 10 percent of the land is annually planted in clean, cultivated crops, such as corn and tobacco. This acreage is about equal to the area with a slope of 10 percent or less, and must be reduced still further if row crops are to be in rotation and planted on gentle slopes. Although the virgin surface soil of the area, rich in organic matter and fertile, has been practically removed from the steep slopes by erosion, it is as a whole still quite productive. With sufficient moisture the subsoil produces good pasture and hay, but it dries out quickly unless there is plenty of rainfall evenly distributed. From the time of seeding until there is enough grass to protect the soil, much sheet erosion and gullying take place on the steep slopes. Strip cropping on steep slopes has not proved effective in controlling erosion, primarily because the heavy subsoil does not absorb water readily and previous erosion permits the concentration of water in small gullies.

In discussing the measures adopted to relieve this situation, the author gives specific definitions of terraces, diversion terraces, diversion ditches, and hillside ditches. Under the local conditions specified, he holds it advisable to cultivate in row crops, in a short rotation, the ridges of the hills from the top to the points

where slopes equal 12 percent grade and to use terracing and contour cultivation to reduce to a minimum sheet erosion, the principal cause of loss of fertility on ridge land. Steep slopes with grades from 12 percent to approximately 30 percent should be used primarily for pasture and meadow crops to produce forage for livestock. Eliminate row-crop cultivation on these slopes; increase the moisture-holding capacity of the soil by adding organic matter; use diversion terraces on steep slopes to aid in controlling erosion while grasses and meadows are being established or reestablished and organic content of soil increased; and plant trees in draws and areas in excess of 30 percent.

Establish and construct terraces on terraceable slopes according to generally accepted practices. Terrace the land when it is in sod or meadow so that outlet channels may be left to provide for the removal of terrace water from near the top of the slope to natural outlets. Make terraces as wide as can be done economically with the equipment and power available. Do not substitute diversion terrace systems for terraces on terraceable land. Plan diversion terrace systems so as to permit field equipment to be moved from the foot of slopes to ridges without crossing terraces. Use diversion ditches only below areas from which little silt will originate. Diversion ditches may be used in connection with strip cropping on long slopes in some sections. Use hillside ditches only on land with a subsoil which resists erosion well, on steep slopes planted to row crops, or to control erosion while meadows and pastures are becoming established. They reduce rather than control the erosion which occurs when heavy rains fall on plowed steep slopes.

[Treatment of wood for bending] (*Puerto Rico Sta. Rpt. 1943, pp. 29-30*).—Use of 10-percent solution of urea to give increased flexibility to bamboo strips and to dried leaves of a palm (*Roystonea regia*) used for twisting into cords to be made into woven backs and seats for chairs is noted briefly. The bamboo was rendered most pliable when the urea solution was heated and the wood bent while hot.

Timber-connector joints: Their strength and design, J. A. SCHOLTEN (*U. S. Dept. Agr., Tech. Bul. 865 (1944), pp. 106, illus. 38*).—An earlier investigation carried out shortly after the introduction of timber connectors into the United States in 1930[2] covered eight of the types then considered the most promising, the tests having been made with Douglas fir and with yellow pine. New designs and the need for data concerning additional woods and timber sizes required a further investigation, and the work here reported upon was carried out with the split-ring, toothed-ring, and claw-plate connectors. This bulletin presents, in extensive detail, current design data for the three types of connectors in various sizes, when used with different species of wood, and provides an analysis of the various factors which affect the strength of connector joints.

The contents of the bulletin are, in part, timber-connector types, their advantages and uses; design of timber-connector joints; derivation of safe working loads for long-continued loading; tables of safe work loads; modification of working loads and factors to be considered in their use; end distance and spacing; placement of multiple connectors; cross bolts; net section; examples of connector-joint design; and tests of fundamental factors affecting connector-joint strength.

Will building paper on the floor of a granary impart an odor to the grain, T. E. LONG (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 4, pp. 32-33, illus. 1*).—Boxes 6 by 3 by 1½ ft., divided by a center partition into 3- by 3-ft. sections, were used for tests of tar paper, 15-lb. asphalt felt, and other building papers used on the

[2]Modern connectors for timber construction, N. S. Perkins, P. Landsem, and G. W. Trayer. (Coop. U. S. D. A.). Washington: U. S. Dept. Com., Natl. Com. Wood Util., 1933, pp. 147+, illus. 84.

floors of the boxes. None of the samples taken from the floor and 6 in. above the floor were found to show any sign of odor that would classify them as objectionable on the market.

The fence exposure tests, B. A. JENNINGS. (Cornell Univ.). (*Agr. Engin., 25 (1944), No. 4, pp. 140-141, illus. 1*).—Observations at testing sites at Bridgeport, Conn., Ithaca, N. Y., Pittsburg and State College, Pa., Sandy Hook, N. J., Lafayette, Ind., Ames, Iowa, Manhattan, Kans., Davis and Santa Cruz, Calif., and College Station, Tex., are discussed with reference, especially, to the effects of atmospheric corrosion upon the various materials; the effect of rust or corrosion on the tensile strength of wire; the variation in rate of corrosion at the several sites due to differences in atmsopheric conditions; and the effect of the weight of the zinc coating upon the life of galvanized wire.

The copper-covered wires tarnished or turned to a dark, greenish-black color the first year and have remained in that condition without rusting. The corrosion-resistant steel wires have withstood 6 yr. of exposure, and they are still in excellent condition. The nickel-chromium alloy wires remain bright. The chromium alloy wires show some dark speckling, and some of the samples have yellowed. The exposure period has not been long enough to determine the tendency of this type of fence. The lead-coated wires showed the effect of corrosion the first year, with the appearance of numerous small blisters or rosettes of rust. In a number of cases on later inspections less rust was reported. There is a possibility that the pin holes seal up and the samples may actually show less rusting. Zinc-coated, galvanized wire was found, first, to turn dark, usually in spots. Following this the wire takes on a yellow tinge which in turn is followed by actual rusting. The zinc gives protection to bare spots. The exposed cut ends of the barbs and at the joints on woven wire remain bright and free from rust nearly as long as the rest of the fence. The uncoated or bare steel wire on exposure to the atmosphere started to rust immediately and in a very short period was 100 percent rusted. The copper content had no bearing on when the steel started to rust. Tensile strength did not fall off until corrosion began. In fact, many of the wires showed a slight gain (maximum, 4 percent). At Pittsburgh copper-bearing bare wires are continuing to corrode less rapidly than the low copper specimens, but the difference is not significant at the other locations. The life and the rate of loss of tensile strength vary with the size of wire. There is evidence that the small gage wires undergo more rapid penetration than do the larger wires. The penetration of corrosion on zinc-coated wire after rust appears is very similar to that on bare uncoated wire. The relation of zinc coating to differences in atmospheric corrosivity is shown in the observations that at Pittsburgh wire coated at the rate of 1.9 oz. per square foot was completely rusted after 6 yr.; at Bridgeport and Sandy Hook a coating of 0.9 oz. per square foot showed 3 and 1 percent of rust, respectively; at State College and Lafayette 0.5-oz. coatings showed only 1 per cent rust; at Ithaca, Ames, and College Station 0.3-oz. coatings showed from 1 to 38 percent; and in the Kansas and California tests 0.25-oz. coatings showed no rust.

One of the most important results thus far obtained is the observation that for any given exposure there is a fairly definite rate of loss of zinc. "Knowing the rate of loss one can determine the length of time required for 100 percent rust for any given coating. From the information obtained from the bare uncoated wire as to loss of strength . . . the expected life of any given fence can be predicted with a fair degree of accuracy. We now have sufficient information so that a manufacturer or consumer desiring a fence of a certain length of life can write the specification without waiting 10 to 25 yr. for the test fences to rust out completely."

Farm electric equipment for postwar needs, G. W. Kable (*Agr. Engin., 25 (1944), No. 4, pp. 119-120, 124, illus. 1*).—The author finds that, although there is much use of electrical appliances in farm homes, not more than 20 percent of farms having access to electric power make much use of electrical devices for farm production. This is due less to any lack of equipment for farm work than to failure to get what has already been designed and made into use. "It would take a supergenius to think of many practical applications of electricity on the farm that someone else has not thought of. It does not take much originality to think of equipment which should be used more widely on farms, if the design and cost were right, if farmers knew about it, and if there was effective distribution."

Electricity for daily farm chores, G. C. Neff (*Agr. Engin., 25 (1944), No. 4, p. 121*).—The author points out that, although progress has been made in replacing hand work on the farm with machinery, unless and until farm work becomes mechanized to the same degree as factory work, farmers will have difficulty in competing with factory operators on an equal basis. The farm badly lags behind the factory in the extent to which electric service is used. A much larger percentage of work is done by hand power on the farm than in the factory. Examples of electrical labor-saving devices economically feasible for farm use are given.

Design for home-built electric-heated chick brooder, R. L. Witz (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 191-193, illus.2*).—Construction of a 4- by 4-ft. brooder heated by eight 60-w. bulbs is described. No thermostat is provided, but the two outside rows of three bulbs each are separately connected by putting a duplex outlet in parallel with the two bulbs of the center row and plugging in the outside rows as they are needed. Bill of materials, cut-piece list, and dimensioned drawings are included.

Electric lamps as a source of heat for home-built chick brooders, D. E. Wiant and J. A. Davidson (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 184-190, illus. 4*).—The temperature pattern under 4- by 4-ft. squares was much more uniform when the heat was provided by eight 60-w. bulbs of the ordinary illuminating types than when two heater-type bulbs were used. The first-named arrangement was shown in the distribution patterns which accompany this paper to give a temperature range of from 87.5° to 78° F., whereas ranges from 100° to 70° and from 110° to 80° were obtained when one 150-w. and one 250-w. heat lamps were used. Such brooders gave satisfactory results when they were operated in room temperatures as low as 34° and a temperature of 22° out of doors.

Making grass silage by the wilting methods, T. E. Woodward (*U. S. Dept. Agr. Leaflet 238 (1944), pp. 4, illus. 1*).—This method calls for field wilting to a moisture content suitable for packing in the silo. The author describes a moisture tester which can readily be made by the farmer and used for routine checks. Essentially, the tester consists of a wooden plunger fitting snugly, but with free movement, in a 12-in. length of 2-in. pipe. For 5 in. up from the bottom, the pipe is drilled with rows of 3/16-in. holes, 10 holes per row, and the rows spaced ½ in. on center. A lever arm of 2 by 4 in. material is pivoted under a block on the wall, 1 ft. from its bearing upon the chisel edge of the top of the plunger and 4 ft. from a weight bucket. A table of weights at which the material to be ensiled is too wet if any juice be expressed, and of weights at which the material is too dry if no juice be expressed, provides data for legumes, for small grains, and for grasses at cut lengths of ¼ in. (preferred) and of ½ in.

Using a pick-up baler for loading grass for silage, E. G. McKibben and R. S. Hudson (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 169-170, illus. 1*).—The use of a cut-off knife type of pick-up baler for loading grass eliminated

much of the work of pulling apart a load of grass when both loading and unloading; reduced the man-hours per ton for unloading by about half; saved, when combined with the use of the windrower on the cutter bar of the mower, the extra operation of raking; and made possible the effective use of inexperienced teen-age boys.

Combine harvesting by terrace intervals, J. R. Carreker. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 4, p. 141, illus. 1*).—To avoid unnecessary crushing of a part of the unharvested crop, inconvenient placing of side-delivered straw, and some other difficulties, the first cut was made near the center of the terrace interval parallel to the downhill-side terrace. The return trip was made with the tractor running in the first cut. Each succeeding cut was made working outward from the opening thus made. Islands in the wide places between terraces were left adjacent to the uphill-side terrace. The islands were finished from the outside, cutting toward the center. This procedure is shown in an accompanying illustration.

There were no discernible differences in either time of harvest or yield by the two methods. Likewise, detailed field observations while harvesting Kobe lespedeza seed indicated no differences in time or yield with the two methods. An advantage was gained by the new method, however, in that only a small quantity of straw was deposited on the terraces and practically all the straw was placed in the mid-interval area where it is most needed.

Developments in peanut harvesting equipment, I. F. Reed and O. A. Brown. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 4, pp. 125-126, 128, illus. 6*).—Peanut diggers of the potato-digger type and vibrator shakers encountered some difficulties. Of the first-named type, 50 machines were built for use in Spanish or bunch peanut areas, but they would not handle the runner type successfully. The consensus of the investigators appeared to be that the blade-type digger units with single supports are the best. If the mechanical-shaking operation is to be performed successfully, the plows must not drag the vines into bunches. One method used to prevent dragging was to divide the rows so that the plow support could pass between them without catching onto the vines which have been cut loose. Another method was to place a rubber-tired wheel so that it rolled on and held in place the vines being cut by the plow. With these additions the blade-type digging units did satisfactory work.

Three types of shaking arrangements showed promise in preliminary field trials: (1) A receding finger-type pick-up drum, (2) a reversed tedder type, and (3) a modified bean buncher. The principle involved in the modified bean buncher has been tried in a number of machines and should prove satisfactory. A two-row machine, using power take-off drive and directly connected to the tractor, would probably be most desirable. Of two outstanding machines using the receding-tooth cylinder principle, both were driven from the power take-off, picked up peanuts, and discharged them over a cylinder by means of an arrangement of receding teeth and were raised or lowered by means of the hydraulic-lift mechanism on the tractor. One unit was mounted on the rear of a four-wheel, general-purpose tractor and used a relatively large cylinder. A sweep wide enough to dig two rows at a time was mounted on another tractor, making the digging and shaking a twice-over procedure. It performed well. The other digger using the pick-up cylinder arrangement had a shaker cylinder of relatively small diameter and worked under a tricycle-type tractor. The height at which the cylinder operated was controlled by the hydraulic-lift-control lever. The loosened peanuts were picked up by the cylinder teeth and discharged back over the top of the cylinder, an action which shakes most of the soil off the peanuts and leaves them lying loosely on the top of the ground. The action of the fingers and shielding was designed to give minimum wrapping

of vines, grass, purslane, etc. Windrow rods can be added, and tend to push the two rows together into a fluffy windrow where the peanut vines dry quickly or may be gathered easily if they are to be stacked.

Preliminary work showed that tedder forks arranged to kick back, as for hay, knocked off too many peanuts. Arrangements with the forks kicking at 90° to the direction of travel met with difficulty in getting complete coverage of the row area. The 90° angle was abandoned. Angles between 45° and 55° or 60° forward appeared satisfactory. Three types of units used successfully were: (1) Single-row shaker complete with digging blade, (2) two-row, pulled type, traction-driven, and (3) two-row, direct-connected, power take-off driven. The action was at 45° forward to the line of travel for these three units. Some operating characteristics of these machines and their adaptability to specific field and crop conditions are further discussed.

AGRICULTURAL ECONOMICS

Plans for agricultural production in Michigan, 1944, E. B. Hill (*Michigan Sta. Quart. Bul., 26 (1944), No. 3, pp. 161-168*).—Preseason 1944 plans as obtained from farm account cooperators are indicated.

The livestock feed situation in Utah, 1943-44, G. T. Blanch (*Utah Sta. Mimeog. Ser. No. 303 (1943), pp. 8*).—The basic data for this presentation have been taken from the reports of the U. S. D. A. Bureau of Agricultural Economics. The 1943 situation is compared with earlier years, particularly the average of the 10-year period 1930-39. The 1943 feed supply is based on the October 1 estimate of the year's total production. Tables deal with the total production of feed crops in Utah, the number of livestock on farms, and the hay and grain produced per animal unit of the major consuming animals.

Power and labor requirements for the production of cotton, corn, and peanuts (*Alabama Sta. Dept. Mimeog. No. 4 (1943), pp. [7], illus. 5*).—This study was made to determine the amount of labor and power required to produce an acre of cotton, corn, and peanuts when using one-mule equipment, two-mule equipment, one-row tractor equipment, and two-row tractor equipment. The data are reported mainly in the form of graphs.

Farm production, disposition, and income from milk, 1940-43, and miscellaneous dairy statistics (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 42+, illus. 1*).—This consists mainly of statistical tables, the section of farm production, disposition, and income from milk 1943 (pp. 1-24) being prepared by J. L. Wilson, and that on market statistics of manufactured products (pp. 22-31) by C. J. Heltemes.

Milk production on farms in 1943 was the second highest in the Nation's history, about 1 percent below that in 1942. More whole milk was sold to plants and dealers than in any previous year, but quantities of cream, retail milk, and farm butter sold by producers were less than during 1942. Prices received by farmers for all types of dairy products were the highest since 1920. Gross farm income from dairy products, including both the cash income and the value of farm-consumed products, but without deduction for farmers' expenses, totaled 3.3 billion dollars, about a fifth more than in any previous year.

In line with a smaller production of milk on farms and the use of more milk for fluid purposes, the output of the major manufactured dairy products declined in 1943 compared with the previous year. Production of creamery butter was down between 4 and 5 percent, American Cheddar cheese about 16 percent, and evaporated milk 13 percent. Partially offsetting these declines, the output of dried whole milk

in 1943 was more than double that of a year earlier, while production of sweetened condensed milk, case goods (skimmed and unskimmed combined), increase 64 percent. The combined use of whole milk for manufactured dairy products, however, was only 55.8 billion pounds in 1943, or 8 percent less than the all-time high of 1942.

Production of farm butter in Maine and possibilities of a shift to fluid milk, G. F. Dow (*Maine Sta. Misc. Pub. 583 (1944), pp. 14+ illus. 4*).—This study is based on data from the U. S. 1940 Census, annual estimates of the U. S. Department of Agriculture, and a survey in July and August 1943 in the general dairy-farming area of the State. The survey included about 500 dairymen, of whom about 20 percent sold farm butter. The importance of production of farm butter in the State, the trends in volume produced, the effects of size of herd on the production, the reasons why farm butter is produced rather than fluid milk sold, the possibilties of shifting from butter to fluid milk, the prices of farm butter, the cost of production and marketing, and the problems of selling are discussed, and comparisons made of the returns from farm butter v. fluid milk sales.

The total sales of farm butter in Maine dropped from 8.4 million pounds in 1909 to 2.4 million pounds in 1942. "The difference in the value received per hundred weight of milk by milk shippers as compared with farm butter producers has increased from 1 ct. in 1921-25 to 15 or 16 ct. in 1926-37, to 26 ct. in 1938-40, to 41 ct. for 1941, to 64 ct. for 1942, to 71 ct. for the first half of 1943, and to $1.11 for the last half of 1943."

Preliminary report of an economic analysis of turkey production in Utah, 1942, D. A. Broadbent, W. P. Thomas, and G. T. Blanch. (Coop. U. S. D. A.). (*Utah Sta. Mimeog. Ser. No. 306 (1944), pp. 16+*).—This preliminary report presents some of the findings of an economic study of turkey production in Sanpete, Sevier, Box Elder, and Cache Counties of Utah for the year 1942 and was conducted for the purpose of determining the economic factors affecting the costs and returns from the turkey enterprise, the relationship of different types of organization and production practices to the efficiency of the enterprise, and to assist producers to analyze their production problems. Among the phases discussed are the organization of the turkey enterprise, cost and other factors related to production, and an analysis of such elements as size of flock, mortality, and costs, and source of mash.

"The more profitable production was found with flocks with the heaviest birds, lowest mortality, lowest priced feeds, and for flocks with highest market grade."

Farm work simplification, H. E. Pinches (*Agr. Engin., 25 (1944), No. 4, pp. 136, 144, 154*).—The author holds, with reference to the question of how far operation analysis and process reorganization should be extended, that on the larger commercial farms with competent management we may expect developments to approximate those in industry. Otherwise, agriculture will decline into relatively greater and greater disparity. On small diversified farms, which have many factors other than production of crops for sale, productivity is no less important. It is only through analysis of what is done, followed by planned reorganization, that improvement can be made, except by the very slow accumulation of knowledge in folkways which grow out of the expensive method of trial and error.

Current farm land market activity in Texas, M. M. Tharp and J. R. Motheral. (Coop. U. S. D. A.). (*Texas Sta. Prog. Rpt. 884 (1944), pp. 8*).—A continuation of the study (E. S. R., 90, p. 842).

Are farm land values inflated? M. M. Regan (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation, 28 (1944), No. 4, pp. 16-19, illus. 1*).—The author concludes

from this comparison of average land values in 1910-34 and 1935-44 that "except for the possibility of substantial reductions either in the general purchasing power of money or in prevailing capitalization rates in the years following the war, farm land values would appear to be at inflated levels in a number of areas. Unless effective action is taken to curb further increases, values in most areas may become as seriously inflated by the end of the present emergency as they were in 1920, with potential consequences of about the general magnitude."

Farm-mortgage debt continues to decline, D. C. Horton and H. D. Umstott (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation, 28 (1944), No. 4, pp. 12-16, illus. 2*).—Revised annual estimates of outstanding farm mortage debt for the period 1930-43, which at the beginning of 1943 was $6,117,168,000, indicate that by the beginning of 1944 net liquidations had brought the total down to about $5,650,000,000.

Statistics of farmers' marketing and purchasing cooperatives, 1942-43 marketing season, G. Wanstall and R. H. Elsworth (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 70 (1944), pp. 23+, illus. 3*).—A continuation of the series (E. S. R., 89, p. 747).

Purchasing farm supplies through Southern States Cooperative, Inc., J. H. Lister and A. Swantz (*U. S. Dept. Agr., Farm Credit Admin. Cir. 128 (1943), pp. 150+, illus. 33*).—"At the close of 1942 the association served 39,736 members of 63 affiliated retail service stores; 31,870 members of 28 local independent purchasing and marketing cooperatives; 7,278 members of 19 affiliated petroleum cooperatives; 1,334 members of the Southern States Marketing Cooperative, Inc.; and 40,959 individual farmer-members of Southern States Cooperative. Members of the last-named group are served through about 607 private service agencies which handle Southern States supplies."

The study, which was based on information obtained through interviews with managers, officials, and employees of the various associations and from audits and other reports, undertakes in general to describe and analyze: "(1) The growth and development of Southern States Cooperative, Inc., and its various related cooperative enterprises; (2) the present Southern States Cooperative membership and organizational structure; (3) the methods employed in operating and financing the various associations which together comprise the Southern States Cooperative system; and (4) the operating and financial status of Southern States Cooperative." Appended are the articles of incorporation and bylaws, the management contract, and financial data for the year ended June 30, 1943.

Successful cooperative cotton gin associations in Texas, W. E. Paulson (*Texas Sta. Bul. 636 (1943), pp. 100, illus. 14*).—"The cooperative cotton gin associations gin from 20 to 25 percent of the Texas cotton crop. Ten years ago Texas had 75 cooperative gins; today the number is 375. . . . Less than 20 percent of the cooperative gin associations are outstandingly successful. A large percentage of the associations have not attained a satisfactory level of efficiency. A historical sketch of the cooperative gin movement in Texas is included in this bulletin as the means of emphasizing the difficulties and problems which had to be mastered before strong and sound cooperative gin associations could be perfected. A detailed analysis is given of four successful cooperative gin associations. The purposes of this analysis in the main are: (1) To disclose to the members of the four associations the more pertinent factors underlying the success of their organizations. The strong features of each association are emphasized. Such changes are suggested as may strengthen these specific associations and as may make them better models for other cooperatives to emulate. (2) To suggest to the management and members of other coopera-

tive gin associations changes which may be made in their own organizational set-up and operating procedure in light of the experiences of these four highly successful cooperative associations. (3) To guide cotton growers about to organize a cooperative gin association. A desirable form of organization, with special emphasis on the capital structure, and a workable operating program, with special emphasis on an economic volume of ginning as related to the size of gin, as revealed by the experiences of these four gin associations should be suggestive to cooperative leaders starting new gin associations. (4) To demonstrate the manner in which data and information in the files of a cooperative association may be analyzed and vitalized to tell a story of significant educational value both to members and to leaders in all capacities. (5) To reveal to all persons with specific or general interests in cooperative enterprises some of the more fundamental factors assuring the success of a cooperative undertaking.

"The three outstanding requisites involved in operating a cooperative gin as a successful business are: An economic volume of ginning; operations at reasonable efficiency; and an adequate gin income per bale. Every successful cooperative gin in Texas has had, without exception, a large volume of ginning. Efficiency greater than average and gin income greater than average as the means of compensating for the paralyzing effects of low volume of ginning fail as alternatives for large volume. There is no substitute for large volume. This bulletin closes with a general discussion on factors of success and failure as applied to cooperative gin associations. This treatment is based in part on points gleaned from the rather voluminous correspondence between the Houston Bank for Cooperatives and the cooperative cotton associations which this bank has financed."

A brief economic survey of the Anderson (S. C.) trading area, G. H. Aull, C. B. Fellers, and J. A. Mixon (*South Carolina Sta. Cir. 68 (1944), pp. 20, illus. 6*).—Anderson in 1940 had a population of 19,424 and a trade area "containing not less than 1,350 sq. miles."

"An immediate objective of the survey was to obtain concrete and specific information which could be used by rural and urban leaders as a basis for the establishment of a more satisfying and mutually beneficial relationship. Specifically, the aim was to get from farmers an appraisal of the facilities and services which they found in the city of Anderson and from merchants some idea as to factors and conditions affecting the local market for farm products." Data were obtained from Federal and State reports, local publications, questionnaires sent to approximately 200 farmers, and interviews with farmers and representative grocerymen. The composition and characteristics of the population of the city, county, the agriculture, manufactures, retail trade, agricultural imports, etc., of the area are discussed. Analysis is made of the replies of farmers as to Anderson as a place to sell and buy and as a service center. Analysis is also made of the facilities available to farmers in the city.

Consumption and marketing of dairy products in Portland, Maine, G. F. Dow (*Maine Sta. Bul. 425 (1944), pp. 171–210+*).—This study is based on data obtained in the summer of 1942, by interviewing 966 consumers and 348 store managers in Portland, South Portland, and Westbrook. The data are analyzed and discussed under the headings of (1) consumption of dairy products, dealing with the average per capita consumption of different products, the effects of family income, size, and age on per capita consumption, etc.; (2) competition of canned milk with fresh milk and cream; (3) competition of farm butter, creamery butter, and margarine; and (4) store sales of dairy products.

"Fresh milk was purchased by 97 percent of the families, cream by 44 percent,

canned milk by 66 percent, butter by 96 percent, and margarine by 10 percent. The average per capita consumption was 2.8 qt. of fresh milk per week, 1.0 one-half pt. of cream per month, 2.1 cans of canned milk per month, and 2.3 lb. of butter and margarine per month." Higher income families had slightly larger than average per capita consumption of fresh milk and butter, much larger consumption of cream, and less consumption of canned milk and margarine. The larger families had lower rates of consumption of all dairy products but a higher rate for margarine. The combined milk equivalent of all dairy products consumed was 30 percent below the minimum requirement recommended for adequate diet.

"The use of canned milk was 11 percent for drinking, 34 percent for cooking, and 55 percent for cream. Canned milk represented only 2.4 percent of the total milk used for drinking, 13 percent of the milk used in cooking, and 66 percent of the cream and canned milk used as cream. The cost of 14.5-oz. can of evaporated milk was 3.8 ct. less than an equivalent volume of fresh milk, and was 17.1 ct. less than an equal volume of light cream."

Consumers' purchases of butter and butter substitutes in the Portland market were 91.9 percent butter and 8.1 percent margarine. Only 5 percent of the butter was farm butter. The retail price of farm butter averaged about 1 ct. less than that for creamery butter. The average price of margarine was 21 ct. per pound as compared with 50 ct. for butter. The average weekly value per store of dairy products and margarine sold was $122, of which 47 percent was butter, 29 fresh milk and cream, 20 canned milk, and 4 percent margarine. The average gross margins for the sales at all independent stores were butter 12 percent, milk 13, cream 16, evaporated milk 17, and margarine 18 percent.

Milk delivery in Knoxville, B. H. Luebke, C. C. Mantle, and W. S. Rowan (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 167 (1944), pp. 33+, illus. 15*).—This is the fourth in this series (E. S. R., 90, p. 844) and is based largely on interviews in a sample area of the city. The method of milk and cream delivery, efficiency of the milk delivery, and consumer preferences for various delivery methods are discussed.

Wheat prices and milling costs in classical Rome, N. Jasny (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 20 (1944), No. 4, pp. 137-170, illus. 9*).—"To reach conclusions on prices required the intensive consideration of wheats, flours, milling technics and costs, and related matters in classical antiquity. A further objective of the study has been to bring order out of the chaos that has characterized the available information on these subjects. If the work contributes only a little to reliable knowledge of the price of wheat in the ancient world, so important for its bearing on purchasing power and cost of living, it goes farther toward settling questions about flour grades and milling costs in classical antiquity.

"A Roman flour with only bran separated, widely used during that period, was 'discovered' in the course of the study. Extraction percentages of flour in antiquity appear to have been substantially higher than some prominent scholars have believed. It was also found that the cost of power for grinding at that time was largely offset by the coarseness of the grinding, and that the total cost of producing flour, while higher than at present, represented only a small part of the flour price."

Indiana turkey prices, T. L. Canada (*Indiana Sta. Agr. Econ. Mimeog. Pub. 28 (1943), pp. 11+, illus. 7*).—Among the phases discussed are production in Indiana and the United States 1931-40, yearly average price movements, factors affecting prices, and seasonal variations.

RURAL SOCIOLOGY

Rural population problems in North Carolina.—I, Population growth, 1790-1940, S. C. MAYO and C. H. HAMILTON (*North Carolina Sta. Tech. Bul. 76 (1943), pp. 58, illus. 20*).—This report shows that North Carolina, among the States composing the southeastern region, ranks first as to size of total population, first as to size of rural population, and fifth as to size of urban population. The proportion of the total population classified as nonwhite in North Carolina has been smaller in each succeeding decade since 1880.

Adventures in small-scale rural enterprises in South Carolina, J. M. STEPP and G. ROWLAND (*South Carolina Sta. Cir. 67 (1944), pp. 32, illus. 15*).—This circular calls attention to some small-scale rural enterprises in South Carolina, including pottery making; broom making; woodworking; cabinet making; basket making; farm implements; custom farm work, in which one farmer with machinery and equipment will do the work of other farmers with inadequate implements and labor; and sirup making.

Social security for farm people: A list of references (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 9*).—This list of references, selected by J. C. Folsom, is intended to guide enquirers to publications relating to Social Security in its possible future application to agriculture.

Farm youth in the 4-H Club: A study in Cortland County, New York, W. A. ANDERSON and D. B. FALES ([*New York*] *Cornell Sta. Mimeog. Bul. 13 (1944), pp. 22+*).—Contrasts are made between farm youth in and not in 4-H clubs. Thus 4-H club members belong to more organizations than nonmembers. A higher percentage of 4-H club members than of nonclub members belonged to such organizations as Sunday school, school clubs, granges, scouts, or campfire clubs and more of the 4-H club members have communication facilities than do nonmembers. A major implication of this comparison is that 4-H clubs tend to draw their membership from families that enjoy more economic and social advantages.

Farm labor camps for city youth are in need of study, W. A. ANDERSON and I. A. SPAULDING. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 2-3, illus. 1*).—Studies made of 15 farm labor camps for city youths whose chief activity was the harvesting of fruits and vegetables. Organizational and operational findings are discussed.

FOODS—HUMAN NUTRITION

A brief review of food and nutrition in five countries (*U. S. Dept. Agr., [Food Distrib. Admin.], 1944, NFC-11, pp. 28+, illus. 1*).—This publication comprises a series of lectures delivered at the U. S. Department of Agriculture in the summer of 1943 by delegates to the United Nations Conference on Food and Agriculture as follows: The Economics of Mexican Nutrition, by F. DeP. Miranda (pp. 1-5); Nutritional Problems of Egypt, by A. Hassan (pp. 6-9); Influence of the Belgian Agricultural Pattern Upon the Nutrition Habits of the Country, by E. J. Bigwood (pp. 11-16); Dietary Habits of the Chinese, by J. H. Liu (pp. 18-21); and Public Health and Nutrition in India, by W. R. Aykroyd (pp. 23-28).

Can we have the right food? L. STANLEY (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 4 (1944), No. 5, pp. 87-90, 93, illus. 4*).—What must yet be done to link production and nutrition more closely together is discussed in this article with special reference to intercountry exchange of foods.

The analysis of Ceylon foodstuffs, X, XI (*Trop. Agr. [Ceylon], 97 (1941),*

No. 4, pp. 185-187; 99 (1943), No. 1, pp. 13-17).—The following papers continue the reports of these investigations (E. S. R., 86, p. 700).

X. *The mineral analyses of some local yams and vegetables,* A. A. Hoover.—Moisture, ash, protein, Ca, P, and Mg are reported for a number of root vegetables, designated only by native or by common English name, and including cassava, sweetpotato, and yam; and for seven leafy vegetables, designated by native and botanical names.

XI, 1. *The composition of some minor fruits, home-pounded grains, and vegetables. 2. The change in the vitamin C content of lime juice preserved with spirits,* A. W. R. Joachim and D. G. Panditteseker.—Percentage and nature of refuse, proximate constituents, Ca and P, and vitamin C are reported for 11 minor fruits designated by common English or native name and by botanical name; similar data, except for refuse and vitamin C, are reported for 3 vegetables and 7 grains designated by English, native, and botanical names.

Extracted lime juice, strained through muslin and treated with rectified spirits to the extent of 10 percent by volume of the juice, was placed in bottles filled three-quarters full and stoppered and stored in the light. Estimations of ascorbic acid by the iodine titration method at intervals of storage indicated progressive loss of ascorbic acid from the samples thus preserved, so that by the end of 3 mo. only about one-twelfth of the original vitamin content remained.

Cooking with soya flour and grits (*U. S. Dept. Agr., 1944, AWI-73, rev., pp. 24*).—This pamphlet offers many recipes utilizing soybean flour or grits in meat, fish, or vegetables dishes; in cereal foods, including baked products using soya flour with wheat flour; and in sandwich spreads, soups and sauces, and desserts.

Freezing late spring and summer fruits and vegetables, F. A. Lee. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 2, pp. 1, 10-11*).—It is pointed out that a wide range of fruits and vegetables lend themselves to this method of preservation and that for vegetables blanching is an essential step in the procedure in order to prevent off-flavor developments and to preserve color and vitamins successfully. Information on varieties especially suitable for freezing and directions are presented for individual fruits and vegetables.

Community canning centers (*U. S. Dept. Agr., Misc. Pub. 544 (1944), pp. 99+, illus. 25*).—This publication, superseding Miscellaneous Publication 472 (E. S. R., 86, p. 414), gives information on the establishment and operation of community canning centers. The material presented is based on the experience of successfully operated community food-preservation centers and is written from the national point of view to apply to all sections; adaptations will be required "for local use and to conform with State food, safety, health, and sanitation laws." The canning technics presented are for approved steam-pressure and water-bath methods and are based on uniform ungraded products, packed in a clean, sanitary manner. The following phases of the subject are considered in detail: Getting the community organized, plan for financing, selecting a supervisor, deciding the size and type of cannery, setting up the plant, education and training, agreements and arrangements before plant operations begin, operating the plant, canning procedure, canning trouble, canning instructions, partial list of manufacturers of canning equipment, and restrictions on production and distribution of food-processing equipment. The references used in preparing the publication are noted.

Food dehydration with infra-red rays, F. P. Ferguson. (Pa. State Col.). (*Food in Canada, 3 (1943), No. 9, pp. 16-17, illus. 4*).—This is a brief review of research work done by J. E. Nicholas and noted elsewhere (E. S. R., 90, p. 273).

Infrared dehydration of meats and vegetables tested, F. M. Tiller,

E. E. Litkenhous, and W. Turbeville (*Food Indus., 15 (1943), No. 10, pp. 77-79, 121, illus. 8*).—Very successful results are reported in preliminary experimental-scale dehydration of carrots, sweetpotatoes, turnip greens, beef, and pork by infrared radiation. From 5 to 25 min. was the time required for dehydration of the vegetables, which were unblanched and, in the case of the carrots and sweetpotatoes, mechanically sliced. The meat was cut in small pieces of about ¼-in. size, precooked at 165° F. for 30 min., drained, and placed directly in the oven. The thinner the slices of vegetables, the less the drying time required. The variation in air temperature did not greatly affect drying rate since only a small portion of the heat was transferred by convection. The theory of infrared dehydration is presented, commercial and experimental equipment are discussed, and experimental results are given.

Home dehydration of chili, E. M. Lantz. (N. Mex. Expt. Sta.). (*Jour. Home Econ., 35 (1943), No. 4, pp. 222-224*).—A small inexpensive home-made dehydrator, the construction of which is described, served to give a very satisfactory dehydrated product which was of better color and texture and was more quickly refreshened that the sun-dried product. Moreover, the dehydrated product contained from three to six times as much carotene as the sun-dried, and the difference in the retention of ascorbic acid was even greater. Oxidative enzymes causing loss of color and vitamins were destroyed by blistering the pods on top of the stove or, more effectively, by dipping the pods in hot oil. This served also to loosen the skins preparatory to peeling and dehydration.

Potatoes baked, then dehydrated to avoid loss of product, O. E. Stamberg and H. Beresford. (Idaho Expt. Sta.). (*Food Indus., 15 (1943), No. 9, pp. 78-79, illus. 2*).—The process developed in a small experimental unit involved baking the washed fan-dried potatoes for 1 hr. at 400° F. in an electric oven, followed immediately by hand peeling of the hot potatoes, ricing of the inner portion, and separate drying of the peels and shreds for 4–5 hr. at 150° to a final moisture content of 5–7 percent. Grinding of the dried shreds to a flour and of the dried peels to a fine meal were optional procedures. The baking resulted in increased yields of dehydrated product, the recovery (shreds and peels) being about 23.6 percent—approximately the total solids content of the potato. About 70 percent of the dried material was in the form of shreds and 30 percent as peels. Crude protein averaged 10.8 and 11.6 percent, and phosphorus 0.25 and 0.26 percent (both on the dry basis) in the shreds and peels, respectively. The shreds reconstituted readily in hot water in from 5 to 10 min., about one part of the shreds being used to four of water. It is pointed out that the process not only eliminates waste but solves a sewage problem as well because the peels are dried.

Varietal suitability for dehydration in eastern freestone peaches, J. S. Caldwell, C. W. Culpepper, and D. H. Scott. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1943), No. 3, pp. 68-71, 89; 4, pp. 101-106; 23 (1944), No. 5, pp. 136-142, 151*).—The material employed included fruit of 62 varieties all grown together in experimental orchards at Beltsville, Md., in a season that was favorable up to the time of harvest, when persistent rain and cloudiness resulted in poor coloration, although the fruit was of average quality. The peaches were picked at several stages of maturity, with each stage dehydrated separately. In general, each lot dehydrated was a composite sample from four trees. All fruit used in the varietal comparisons was sulfured with liquid SO_2 at the rate of 6 lb. per ton of fruit. The exposure period was ¾ hr. for unpeeled fruit and 1–1½ hr. for the peeled, according to degree of ripeness. Drying was begun at an initial temperature of 140°–145° F. and finished at

120°–125°, at which time the fruit had a residual moisture content of 18 percent. After storage for 2 weeks at 75° to equalize moisture content, each lot was subdivided for storage in airtight and nonairtight containers at 50° and 75° for 6 mo. prior to examination and grading.

In peeled form the varieties that graded best or excellent were Lovell, Golddrop, Valiant, and Veteran; those graded very good were Canadian Queen, Early Elberta, Engle, Fay Elberta, Fertile Hale, Halehaven, Ideal, July Elberta (= Mikado), Kalamazoo, Lemon Free, Rio Oso Gem, Southhaven, Sunhigh, and Viceroy; other varieties fell into classes designated as good, fair, and poor to very poor. In the last group flavor, palatability, appearance, and color were poor; in the other groups flavor and palatability were satisfactory and the defects were those of appearance and color which might have been lessened by more prolonged sulfuring. In general unpeeled samples graded one or two steps lower than corresponding peeled samples, since the peels had unattractive grayish yellow and brownish purple colors, dehydrated poorly, remained tough on cooking, and had an unpleasant bitter-astringent flavor. The unpeeled products were graded into three groups—good, fair, and poor—of which the first included Early Elberta, Eclipse, Elberta, Engle, Fay Elberta, Fertile Hale, Golden Jubilee, Golddrop, Ideal, July Elberta, Kalamazoo, Late Elberta, Lovell, and Veteran.

About three-fourths of the 62 varieties made products good to excellent in texture and flavor and acceptable in appearance when dried in the peeled condition at the optimum stage of ripeness. Color, texture, sweetness, and flavor improved progressively as the fruit passed from the firm-ripe to the soft-ripe condition on the tree, and this improvement was carried over into the dried product. It is considered that Eastern dessert-type freestone peaches could be successfully employed for dehydration should the necessity develop.

Dried whole egg powder, V-IX (*Canad. Jour. Res. 21 (1943), Sect. D, Nos. 8, pp. 267-269, illus. 1; 9, pp. 271-276; 10, pp. 332-339, illus. 5; 11, pp. 341-347; 12, pp. 389-393, illus. 1*).—A continuation of this series (E. S. R., 90, p. 553).

V. *Definition and properties of low grade egg powders,* M. W. Thistle, M. Reid, and N. E. Gibbons.—Ten samples were obtained which, on the basis of their storage history, could be expected to receive scores between 5 and 0 on the taste scale used (E. S. R., 90, p. 299), wherein the score ranged from 10 for excellent fresh egg to 0 for repulsive material. The samples were reconstituted and scrambled and scored by an experienced taste panel and the scoring was repeated on the following day with the order of the samples changed. On the basis of the average of the seven or eight judgments available for each sample, 100 percent considered the sample rated 4 as edible and the sample rated 1.4 as inedible. The point at which 50 percent of the tasters regarded dried whole egg preparations as unsuitable for human consumption coincided with a rating of 2.7. The protein fraction of these low-grade samples had deteriorated badly as shown by fluorescence measurements (E. S. R., 90, p. 553), but the fat fraction showed no evidence of peroxide oxygen formation.

VI. *Effect of storage temperature and gas packing on keeping quality,* W. H. White, M. W. Thistle, and M. Reid.—Egg powders from three representative Canadian egg-drying plants were placed in cardboard containers with metal ends and placed in storage at temperatures of 45°, 60°, 75°, and 90° F. Samples held in storage for periods up to 6 mo. were examined for changes in quality as assessed by determination of the fluorescence and KCl values. At 75° the rate of deterioration was fairly rapid, and at 90° it was markedly so. The fluorescence values for powders stored at 45° and 60° were essentially unchanged after 4 mo.;

the KCl values decreased during storage, but the changes were least and of approximately the same magnitude at 45° and 60°. These results suggested that egg powder should be held at temperatures at 60° or lower if quality is to be maintained during storage and transport. In other tests samples of egg powders were packaged in nitrogen, carbon dioxide, in vacuo, and in the form of compressed tablets (rapid compression under 800 lb. per square inch at room temperature). Examination of samples stored for 1, 2, and 6 mo. showed that packing in carbon dioxide had definite preservative effect as indicated by fluorescence and KCl values. Storage under other conditions had little beneficial effect.

VII. *Effect of temperature and moisture on the bacterial content of liquid and dried egg,* N. E. Gibbons and C. O. Fulton.—Experiments to determine the effect of temperature on the bacterial content of liquid egg showed that there was a rapid increase in the bacterial count after about 6 hr. at 68°, 12 hr. at 60°, 25 hr. at 52°, and 2–3 days at 45°. At 38° there was little change for 5-6 days, followed by a very gradual increase. Information collected during actual plant operation and in the laboratory indicated that "the bacterial content of dried egg powder was influenced by the number of bacteria in the melange, the drying temperature, the rate of cooling, the storage temperature, and the moisture content. Low drying temperature and rapid cooling of the powder favored survival. On storage the bacterial mortality increased with increasing time and temperature." At temperatures above 86° the death rate seemed to be proportional to changes in temperature. At 45° and lower the majority of organisms survived 8 months' storage. Up to 8.6 percent, moisture content had little effect on bacterial survival. At moisture levels above 5 percent there was an increase in the number of molds, perticularly at 75° and 90°.

VIII. *An improved fluorescence method and some factors affecting the measurement,* J. A. Pearce, M. W. Thistle, and M. Reid.—The effects of certain variations in the fluorescence method previously used were investigated. Fluorescence values did not differ significantly whether two or three chloroform extractions or three chloroform or three ether extractions of the dried egg were made; whether 10 percent KCl or 10 percent NaCl was used as the protein solvent; and whether shaking times varied from 5 to 120 min. and shaking speeds from 100 to 390 impulses per minute. In order to avoid the prolonged filtration periods and to effect a saving in chemicals, the method was inproved as follows; 2.5 gm. of egg powder was defatted with three 25-cc. portions of chloroform; 1 gm. of the defatted powder was shaken for 30 min. with 100 cc. of 10 percent sodium chloride, filtered, and the fluorescence of 15 cc. of the filtrate determined in a photofluorometer. The effect of temperature on both the fat and the protein extractions was investigated by carrying out these operations at temperatures from 38° to 73°. In the course of the two operations, the over-all increase in fluorescence value was 0.36 unit for each temperature increase of 1° F. It is recommended, therefore, that laboratory temperature be kept as nearly constant as possible, or failing this, that suitable corrections be made for temperature variations. In general, a decrease in the pH of the protein extracts was found to be associated with an increase in fluorescence values but variations of the pH of the protein solvent from 4.6 to 8.9 caused no significant increase in fluorescence values.

IX. *Effect of drying conditions on quality,* A. H. Woodcock and M. Reid.—"Liquid whole egg was spray dried in a small laboratory drier at various flow rates of liquid egg and at different inlet and exhaust air temperatures. Quality of the powder, as assessed by chemical methods, palatability, and baking tests, was progressively improved as the exhaust air temperature was lowered. Inlet air temperatures above 107° C. (225° F.) had a deleterious effect. Lowering the drying temperature, however, had an adverse effect on the rate of production."

Basal metabolism of normal boys and girls from two to twelve years old, inclusive, R. C. Lewis, A. M. Duval, and A. Iliff (*Amer. Jour. Diseases Children, 65 (1943), No. 6, pp. 834-844, illus. 5*).—Earlier determinations of the basal metabolism of this age group (E. S. R., 77, p. 883) have been extended by 551 determinations following the same technics on 56 boys and 395 on 46 girls, and the data obtained have been compared with the earlier data in terms of mean values for calories per hour per square meter in relation to age and calories per hour in relation to weight, height, and surface area, respectively.

Significant differences were found in only four isolated groups. The new mean value for calories per hour per square meter for boys was significantly higher than the old value at the 2-yr. age level and significantly lower at the 10-yr. level. For the girls, significant deviations occurred in the grouping of 26 to 27 kg. weight, inclusive, when calories per hour were referred to weight and in the grouping of 0.97 to 1.03 m.^{2} body surface, inclusive, when calories per hour were referred to surface area. Sampling is suggested as the cause of these few significant differences. "The exceptions are of little importance, since a weighted average of the means of these groups does not differ significantly from either of the means from which it is derived. Thus, the reliability of the entire data of the two studies has been established."

When individual data reported in the literature since 1936 were compared with the present data, it was found that the majority of the results fell within ± 15 percent of the mean value of the present study by all four methods of reference. The mean percentage deviations of all determinations in the literature cited from the mean values of the present study ranged from $+ 0.3$ percent in calories per hour referred to weight (girls) and in calories per hour referred to height (boys) to $+ 7.3$ percent in calories per hour per square meter referred to age (boys).

Basal metabolism of normal children from thirteen to fifteen years old, inclusive, R. C. Lewis, A. M. Duval, and A. Iliff. (*Amer. Jour. Diseases Children, 65 (1943), No. 6, pp. 845-857, illus. 4*).—This report of progress on an extension of the basal metabolism studies noted above covers 90 determinations on 17 boys and 52 on 13 girls. From the data obtained, the means and the standard deviations from the means together with their respective standard errors and coefficients of variation have been computed at convenient class intervals for calories per hour, per hour per square meter, per hour per centimeter, and per hour per kilogram, respectively.

A comparison of the mean coefficients of variation for each of these computations for the boys showed the lowest degree of scatter about the mean for calories per hour per square meter referred to age and for calories per hour referred to weight and surface area, respectively, and the highest for calories per hour per kilogram and for calories per hour, respectively, referred to age, with an intermediate degree of scatter for calories per hour per centimeter referred to age and calories per hour referred to height. The girls differed from the boys in that a low degree of dispersion was found for calories per hour per centimeter referred to age and an intermediate rather than a high degree of scatter for calories per hour referred to age. A detailed comparison was also made of the data reported in the present study with similar data from the literature, more than 50 references to which are cited. From the reports giving a minimum of 10 determinations on individual subjects, histograms of the frequency distribution of the percentage deviations from the mean values of the present study were constructed. In comparisons of the combined individual data in the literature with the mean values of the present study, the mean percentage deviation was lowest, $+ 2.7$ percent,

for calories per hour referred to weight (girls) and highest, + 8.3 per cent, for calories per hour per square meter referred to age (boys). "In evaluating the basal metabolism of 13-, 14-, and 15-year-old children, consideration must be given to the possibility that the basal metabolism in this age range bears a relationship to the stage of adolescent development which has been attained."

Standards for the basal metabolism of children from 2 to 15 years of age, inclusive, R. C. LEWIS, A. M. DUVAL, and A. ILIFF (*Jour. Ped., 23 (1943), No. 1, pp. 1-18, illus. 14.*)—Data on the basal metabolism of normal children from 2 to 12 and 13 to 15 yr. of age as reported in the papers noted above and the earlier study of the lower age group (E. S. R., 77, p. 883) have been used in the establishment of standards for the basal metabolism of children from 2 to 15 yr. of age, inclusive, on the basis of 1,007 determinations of 70 normal, healthy boys and 718 on 57 normal, healthy girls. The methods of reference selected were calories per hour per square meter referred to age and calories per hour referred to surface area, weight, and height, respectively. Scatter diagrams constructed for the respective data are presented, in which are also indicated the means for certain convenient arbitrary intervals as well as the values for plus and minus to standard deviations from the means. The standards are taken from the unbroken line curve drawn to connect these means.

The standards thus obtained are compared graphically with certain comprehensive reports in the literature, and the general applicability of the standards and the choice of methods for evaluating basal metabolism are discussed with emphasis on the importance of considering body size in the selection of standards to be used for the interpretation of the basal metabolism of any individual child.

The families of the Child Research Council: A study of families whose children are similar to those in urban pediatric practice, D. G. DUNLOP (*Jour. Ped., 22 (1943), No. 1, pp. 111-120, illus. 4*).—This report discusses the general socioeconomic status of the families in Denver, Colo., whose children are being studied as they develop from birth to maturity by the Child Research Council, an independent research institute affiliated with the University of Colorado School of Medicine, whose purpose is "to set up more adequate standards for the appraisal of growth, development, and health of the individual child. The physical, social, and mental make-up of each child has been taken into consideration in an effort to obtain an adequate picture of the child as a whole." The three papers noted above are from the council.

Anthropometry in the pediatrician's office: Norms for selected body measurements based on studies of children of north European stock, V. S. VICKERS and H. C. STUART (*Jour. Ped., 22 (1943), No. 2, pp. 155-170, illus. 2*).—In a series of 21 tables norms are given for certain body measurements based upon studies of children principally of northern European stock living in the vicinity of Boston in homes of low to middle economic circumstances but in which the parents have the advantage of periodic health and nutrition advice. The values given include medians and certain other percentiles, extremes of the series, and means and sigmas for these measurements at succeeding ages from birth to 10 yr. A few comments are given on the choice of measurements, the types of apparatus are described, and the various measurements and standard technics are defined.

Fat oxidation in experimental animal diets, D. F. CLAUSEN, R. H. BARNES, and G. O. BURR (*Soc. Expt. Biol. and Med. Proc., 53 (1943), No. 2, pp. 176-178, illus. 3*).—Dietary mixtures, with variations in the source of the B vitamins (yeast or pure B vitamins) and the nature of the fat (steam-rendered lard or bland, stabilized lard, both of these with and without wheat-germ oil and

cod-liver oil), were compounded in 200-gm. lots and stored in glass bottles in the dark at room temperature. Samples were removed at weekly intervals, and peroxide values as an indication of rancidity development were determined on the extracted fats. The results presented as peroxide value-time curves indicated the relative keeping time of fats added to the various dietary mixtures. Thus, the rancidification of lard in a diet which did not contain yeast was very rapid. With the addition of cod-liver oil and wheat-germ oil, the rate of accumulation of peroxides was considerably less. However, these oils also showed instability in time. Other methods of stabilization, as by the addition of 0.1 percent of gum guaiac to the lard, were also advantageous in prolonging the induction period. These results point to the importance of careful preservation of experimental diets, lest destruction of dietary essentials and development of toxicity due to rancid fats confuse the interpretation of diet experiments.

The effect of sodium bicarbonate on gastric secretion, W. L. Adams, C. S. Welch, and B. B. Clark (*Amer. Jour. Physiol., 139 (1943), No. 3, pp. 356-363, illus. 2*).—Changes produced in gastric secretion by a 1.5 and a 2 percent solution of $NaHCO_3$ administered three times daily in doses of 50 cc. by stomach tube or a 4 percent solution placed directly in the pouch were studied by use of a new technic employing the Cope pouch dog. "Sodium bicarbonate produced an increase in the gastric secretory activity during hours immediately following a test meal, with a partial compensatory decrease during later hours. The role of these factors in 'rebound' or 'secondary' gastric acid secretion, as observed in fractional gastric analysis, is discussed." The study was conducted with the technical assistance of D. B. Blair and J. J. Romano.

The effect of caffeine and coffee extract on the activity of the digestive enzymes, F. Walker. (Rutgers Univ.). (*Amer. Jour. Physiol., 139 (1943), No. 3, pp. 343-346*).—In vitro tests were conducted with caffeine, in concentrations of 20 and 40 mg. per 100 cc. of substrate, and with coffee extract in concentrations of 20 and 40 cc. The coffee extract was prepared by adding 5 gm. of ground coffee to about 100 cc. of boiling water, allowing to stand for 5 min. with occasional stirring, filtering, and making up to 100 cc. The substrates were a 1 percent dispersion of soluble starch with added activators and a 1 percent casein dispersion. In the concentrations used, caffeine had no effect on the saccharogenic action of salivary and pancreatic amylases, nor did it affect the digestion of casein with pepsin and trypsin or of olive oil with pancreatic lipase. The coffee extract did not affect the digestion of casein by pepsin or trypsin; however, it increased the rate of digestion of starch by the salivary and pancreatic amylases and retarded the digestion of olive oil by pancreatic lipase.

Growth of major long bones in healthy children: A preliminary report on successive roentgenograms of the extremities from early infancy to twelve years of age, M. M. Maresh (*Amer. Jour. Diseases Children, 66 (1943), No. 3, pp. 227-257, illus. 9*).—Seriatim roentgenograms obtained for the left arm and leg by a method previously described (E. S. R., 82, p. 132) were taken on a group of 113 upper-middle-class children, including 52 girls and 61 boys, at semiyearly intervals up to 12 yr. of age. From the 671 sets of such roentgenograms, measurements were made of lengths of the humerus, radius, ulna, femur, tibia, and fibula. The individual data are presented, and values are given for the tenth, twenty-fifth, fiftieth, seventy-fifth, and ninetieth percentiles of each of the long bones at 6-mo. intervals, from 6 mo. to 12 yr. of age. Increases in the length of bones on successive measurements indicated that growth rate, at least up to 10 yr. of age, was remarkably orderly. Growth curves for individual children compared with the percentile standards showed that in half of the

children there was no percentage shift in the relative position (percentile ranking) of any of the six bones during the period of measurement. Other children showed either increases or decreases in relative lengths in some of the bones. An approximately straight-line relationship was found between the length of one bone and that of another, and there was also a high correlation between length of the bones and stature.

Mineral metabolism of healthy adults on white and brown bread dietaries, R. A. McCance and E. M. Widdowson (*Jour. Physiol., 101 (1942), No. 1, pp. 44-85, illus. 1*).—This is a detailed report of mineral-balance experiments carried out over a period of 9 mo. on five healthy men and the same number of women, receiving diets in which 40–50 percent of the calories were provided by wheat flours of the following types: 69 percent extraction, 92 percent extraction, 69 percent extraction fortified with calcium carbonate or monohydrogen phosphate; 92 percent extraction fortified with the same salts, 69 percent extraction with the addition of sodium phytate, and 92 percent extraction with a supplement of 2,000 International Units of calciferol per day.

"The calcium, magnesium, phosphorus, and potassium in diets made up with 92 percent flour were less completely absorbed than the same minerals in diets made up with 69 percent flour. Hence, in defining calcium requirements, it is essential to state the nature of the cereal in the diets. Sodium phytate added to 69 percent flour depressed the absorption of calcium and magnesium, but not of potassium. About 50 percent of the phosphorus in sodium phytate was absorbed. Vitamin D did not materially improve the absorption of calcium from diets made up with 92 percent flour. Fortifying the bread with calcium salts improved the absorptions of calcium and prevented a loss of calcium from the body if this had been taking place. The carbonate and phosphate were equally efficacious. The addition of calcium carbonate slightly depressed the absorption of phosphorus. It has been recommended that flours for national use during the present emergency should have calcium carbonate added to them in the following proportions—white flour, 65 mg. of calcium per 100 gm.; National 85 percent wheat meal, 120 mg. of calcium per 100 gm.; 92 percent wheat meal, 200 mg. of calcium per 100 gm."

Mineral metabolism on dephytinized bread, R. A. McCance and E. M. Widdowson (*Jour. Physiol., 101 (1942), No. 3, pp. 304–313*).—Three men and three women, some of whom had taken part in the above investigation, participated as subjects in mineral-metabolism studies to compare Ca, Mg, and P absorptions from the different bread dietaries in which 40-50 percent of the total calories were supplied by the following bread flours: "(1) A 'brown' flour reconstituted from white flour and bran, (2) a flour mixture similar to (1) in which the phytates had been hydrolyzed enzymically to inorganic phosphates and inositol, (3) a mixture of white flour and bran from which nearly all the phytates and most of the products of hydrolysis had been removed, (4) white flour." The laxative properties of the breads made from flours (1), (2), and (3) were similar, thus ruling out this effect as the cause of the observed differences in mineral absorption. The Ca absorptions were worse in (1) than in (2), and in (2) than in (3), but almost the same in (3) and (4). Mg absorptions improved progressively in passing from (1) to (4). The P absorptions were worse in (1) than in (2) or (3), and a little worse in (2) or (3) than in (4). These results, together with those from the above study, indicate that the phytic acid in brown flour is responsible for the poor absorption of Ca and Mg and that the P of phytic acid is less freely absorbed than inorganic P.

The significance of urinary calcium, magnesium, and phosphorus, R. A.

McCance and E. M. Widdowson (*Jour. Physiol., 101 (1942), No. 3, pp. 350-354*).—In metabolism experiments noted above, information was obtained on mineral absorption and excretion of normal persons. In these studies each experiment lasted at least 14 and, usually, 21 days, together with the usual 3 or 4 preliminary and 1 and 2 afterdays, thereby largely eliminating the effects of daily fluctuations in urinary excretion and the short-term variations in fecal output. The data presented and discussed are summarized as follows: "The urinary excretions of Ca, Mg, and P by normal persons rise and fall with the intestinal absorptions. They do not, however, rise so high or fall so low as the absorptions may do. From the technical point of view, a change in a normal person's urinary excretion should be regarded as an indirect but very valuable confirmation of a change in intestinal absorption. In these, as in so many other, branches of metabolism the function of the kidney is to regulate the stability of the internal environment."

Seasonal and annual changes in the calcium metabolism of man, R. A. McCance and E. M. Widdowson (*Jour. Physiol., 102 (1943), No. 1, pp. 42-49, illus. 1*).—In the course of the long-time mineral-metabolism studies on the bread dietaries discussed above, the individual subjects who remained on experimental regime for 1 and even 2 yr. were observed to show seasonal and annual variations in metabolic behavior. The data presented and discussed showed that large seasonal variations in Ca absorption took place in three out of the six subjects. Least Ca was absorbed in February and March—most in July and August. The five persons who were under observation in the successive summers and autumns of 1940 and 1941 all absorbed Ca more freely in the former year. All changes in Ca absorption were accompanied by corresponding changes in urinary excretion. The Mg absorptions and excretions did not fluctuate in the same way and remained very constant over the whole period of investigation. The administration of 2,000 International Units of vitamin D in March 1941 did not materially improve the absorption or urinary excretions of Ca. The absorption and excretion of P, followed in parallel with those of Ca and Mg, showed no changes, either annual or seasonal.

Radioactive iron absorption by gastro-intestinal tract: Influence of anemia, anoxia, and antecedent feeding distribution in growing dogs, P. F. Hahn, W. F. Bale, J. F. Ross, W. M. Balfour, and G. H. Whipple (*Jour. Expt. Med., 78 (1943), No. 3, pp. 169-188*).—In the experiments described, radioactive iron was administered by gavage or by direct instillation in pouch—and fistula—dogs and the iron absorption measured by estimating the increase in the total radio-iron in circulation in the red blood cells. This calculation of iron absorbed involved an estimate or measurement of the red cell circulating mass. Plasma and tissue radio-iron determinations were also made in some cases. Results from the many determinations indicated that iron was absorbed by means of the gastrointestinal mucosal epithelium. The normal nonanemic dog absorbed little iron, but the dog with chronic anemia due to blood loss showed considerable absorption, from 5 to 15 times normal. Sudden change from normal to severe anemia within 24 hr. did not significantly increase iron absorption. As the days passed, new hemoglobin was formed. The body iron stores were depleted, and within 7 days iron absorption was active, even when the red cell hematocrit was rising. Anoxemia of 50 percent normal oxygen concentration for 48 hr. did not significantly enhance iron absorption. Ordinary doses of iron given from 1 to 6 hr. before radio-iron appeared to cause some "mucosa block," i. e., the intake of radio-iron was less than anticipated. Iron given by vein some days before the dose

of radio-iron did not appear to inhibit iron absorption. Plasma radio-iron absorption curves varied greatly, showing sharp peaks in from 1 to 2 hr. when the iron was given in an empty stomach, but after 6 hr. when the radio-iron was given with food. The plasma iron returned to normal in from 6 to 12 hr. Gastric, duodenal, or jejunal pouches all showed very active absorption of iron. The plasma concentration peak sometimes reached a maximum before the solution of iron was removed from the gastric pouch, thus indicating a mucosa block.

In a study of absorption and distribution of radio-iron in the body of growing pups, the spleen, heart, upper gastrointestinal tract, marrow, and pancreas showed more radio-iron than was expected. It is considered that the term "physiological saturation" in the case of iron may be applied to the gastrointestinal mucosal epithelium and explain one phase of acceptance or refusal of ingested iron. Desaturation was a matter of days not hours, whereas saturation sometimes took place within from 1 to 2 hr. This change is thought to be a part of the complex protein metabolism of the cell.

Mottled nails: An early sign of fluorosis, L. SPIRA (*Jour. Hyg. [London]. 43 (1943), No. 1, pp. 69-71, illus. 12*).—A description is given of changes produced in the finger- and toenails in chronic fluorine poisoning. These changes, present to varying degrees, depending upon how advanced the changes are, may involve thickening; elongation; separation of the nail plate from its bed; occurrence of opaque, chalky white specks, patches, and transverse bands; longitudinal striation; transverse furrows; and brittleness. Mottled nails will gradually regain their normal appearance when the appropriate treatment directed against fluorosis has been instituted and the ongrowing portion which was affected has been cut off.

Some constituents of malt extract, J. G. ORGAN, J. DUNCAN, M. E. WESTBROOK, and F. WOKES (*Quart. Jour. Pharm. and Pharmacol., 16 (1943), No. 3, pp. 275-281, illus. 1*).—The content of vitamin B_1, protein, and reducing sugar and the diastatic activity were determined in a series of malt extracts, including commercial (British) and expermental samples. A variation of 250–300 percent was observed in the protein contents of different samples. In 45 samples from 31 manufacturers the protein averaged 5.6 percent. Omitting 3 fortified samples, a variation of 250 percent occurred in the vitamin B_1 content. In 12 normal samples containing not less than the (British) pharmacopoeial minimum of protein (4.5 percent), and obtained from 8 manufacturers, the average vitamin B_1 content was 123 International Units per gram. On the whole, malt extracts with low diastatic activity contained less vitamin and protein. The vitamin B_1 content of malt extract may diminish appreciably during storage with a slower rate of loss in certain fortified malt extracts.

The effects of storage and different methods of cooking on the carotene and ascorbic acid contents of carrots (*New Mexico Sta. Rpt. 1943, pp. 47-48*),—This preliminary report of a study conducted as part of the National Cooperative Project, Conservation of the Nutritive Value of Foods, is concerned with variations in carotene and ascorbic acid content of the freshly harvested carrots and with changes in these components during storage and in cooking of the carrots. In storage the apparent vitamin A at first increased, then decreased, while ascorbic acid decreased rapidly at first and then more slowly upon continued storage. There was evidence that some reducing substance other than ascorbic acid was formed if the carrots withered in storage. Shredding of the raw carrots caused destruction of about half of the ascorbic acid. Cooking losses ranged from 14 to 43 per cent; further loss up to 83 percent occurred if the carrots were kept hot for 1¾ hr. Salt in sufficient quantity in the cooking water reduced the ascorbic acid loss. There was little or no loss of carotene during storage.

Relation between hepatic and plasma concentrations of vitamin A in human beings, H. Popper, F. Steigmann, K. A. Meyer, and S. S. Zevin (*Arch. Int. Med., 72 (1943), No. 4, pp. 439-460, illus. 11*).—Essentially noted from a preliminary report by Meyer et al. (E. S. R., 88, p. 706).

Riboflavin, vitamin B_6, and filtrate factors in wheaten flours and offals, A. M. Copping (*Biochem. Jour., 37 (1943), No. 1, pp. 12-17*).—In all tests estimations were made by the biological method, in which the growth of young rats on basal diets made up with the test substances at two levels was compared with the growth of control animals on the standard basal diet, in which the vitamin in question was supplied at two levels in pure form, or, in the case of the filtrate factor, in the form of a dried bakers' yeast. Litter-mate rats, as far as possible of the same sex, were given the doses to be compared. The products tested were all obtained from the same lot of wheat and included (1) a straight-run, unbleached white flour of 73 percent extraction, (2) 85 percent extraction natural wheatmeal, (3) a 100 percent whole meal flour, (4) weatings (middlings), (5) bran, and (6) germ, representing all the clean germ obtained in the milling of wheat flour. These products in the order named contained the following amounts of riboflavin in micrograms per gram fresh weight: 0.85, 2.0, 2.3, 4.0, 4.8, and 9.9. The 73, 85, and 100 percent extraction flours, the middlings, and the germ contained, respectively, 2.5, 4.2, 5.0 (approximately), 13, and 12.8 μg. vitamin B_6 (hydrochloride) per gram fresh weight and filtrate factors to the extent of 40–50, 80, 110, 190, and 225 mg. equivalents of the yeast.

Riboflavin and vitamin B_1 in war-time beers, R. H. Hopkins (*Nature [London], 152 (1943), No. 3853, p. 274*).—Riboflavin, determined by the microbiological method of Snell and Wright as modified by Barton-Wright and Booth (see p. 250), ranged from 0.47 to 1.2 μg. per cubic centimeter in the 14 samples of (English) beer tested. Sixteen beers, including 3 "strong" ales, contained from 1 to 6 International Units of thiamine per 100 cc., as determined by the fermentation technic of Schultz et al. (E. S. R., 88, p. 293). Apparently much thiamine is lost from bright beer and is removed with the yeast, but most of the riboflovin from the original malt remains in the beer.

Riboflavin and vitamin B_1 in nineteenth century buns and ale, E. C. Barton-Wright, T. Moran, and H. S. Sarson (*Nature [London], 152 (1943), No. 3853, p. 273*).—Four currant buns that had been baked in 1863, 1887, 1888, and 1890 and kept as souvenirs were analyzed for their contents of thiamin and riboflavin, the latter determined by the method of Barton-Wright and Booth (see p. 250). Thiamine averaged 0.15 International Unit and riboflavin 6.7 μg. per gram. Microscopical examination of two of the buns showed that they had been made with yeast or barm. It was probably brewers' yeast, as suggested by the high riboflavin values of the buns. Present-day dried plain and debittered brewers' yeast examined contained 33 I. U. thiamine and 54 μg. riboflavin per gram (9.5 I. U. and 15 μg., moist basis). Four present-day beers contained from 0.9 to 1.7 μg. riboflavin per cubic centimeter. These values used in calculations applied to an old bun recipe failed to account for the high riboflavin value of the buns and suggested that yeasts or beers of those days were very high in riboflavin or were used in large amounts in the recipe. The low figure for thiamine in the buns indicated that, unlike the riboflavin, there had been considerable destruction in the 50-80-yr. interval.

Increased resistance to ulcerative cecitis of rats on a diet deficient in the vitamin B complex, A. L. Bloomfield and W. Lew (*Jour. Nutr., 25 (1943), No. 5, pp. 427-431*).—Healthy young rats from a colony in which a spontaneous infection—chronic ulcerative cecitis—had been prevalent were used in these experi-

ments. Fourteen control rats were placed on a normal diet, while 16 experimental animals, litter mates of the controls, were given a "B-complex-free" diet. Litter mates from both sets were sacrificed after 82-167 days, at which time the rats were 4–7 mo. old. In this period rats on the B-complex-free diet failed to develop the spontaneous ulcerative cecitis except very mildly in an occasional animal, while one-half of the litter-mate controls had the disease mostly in well-advanced form. This was an example of increased resistance to infection, rather than increased susceptibility, brought about by undernutrition and vitamin deficiency.

Factors affecting the ascorbic acid content of cabbage lines, C. F. Poole, P. C. Grimball, and M. S. Kanapaux. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 8, pp. 325-329*).—A study of some factors determining variability in ascorbic acid content of cabbage was conducted with 25 breeding lines planted in a randomized-block design having 3 replicates in the fall of 1941 and 3 in the spring of 1942. Variance of ascorbic acid alone was compared with the covariance of ascorbic acid on head weight; and covariance was found as the errors of estimate when the main terms were compared by Snedecor's method with the error term. The mean unadjusted ascorbic acid readings were adjusted by the formula $X = Y - bx$, where $Y =$ individual ascorbic acid readings, $b =$ regression coefficient of the error term, $x =$ departure of weight from the general mean, and $X =$ adjusted individual ascorbic acid reading. Head characters were classified in the field at the time of harvest, and ascorbic acid content was determined as soon as possible afterward on an aliquot segment by the method of Morell (E. S. R., 87, p. 15). There was a significant degree of negative correlation between ascorbic acid content and head weight among breeding lines grown in fall and spring, but in six lines highest for the vitamin, according to adjusted ranking, four exceeded average weight. Genetic differences exerted the major effect. Seasonal influence was inconsistent in different lines.

Vitamin C content of lima beans, J. H. Mitchell (*South Carolina Sta. Rpt., 1943, pp. 63-64*).—This progress report of work conducted as part of the National Cooperative Project Conservation of Nutritive Value of Foods, presents data to show the effect of storage and cooking on the ascorbic acid content of bush lima beans in early and medium stages of maturity. The beans harvested in the early stages of maturity showed a higher ascorbic acid content (approximately 35 mg. per 100 gm. green weight) than those harvested in a more advanced stage of maturity (approximately 32 mg. per 100 gm.). Losses of ascorbic acid following harvest were less under refrigeration than when the beans were kept at room temperature. Shelled beans stored for 48 hr. had a somewhat lower vitamin content following the storage period than beans in the pod stored for 96 hr. Cooking reduced the vitamin C content of the beans significantly.

TEXTILES AND CLOTHING

The historical background of the new standards for light fastness, W. H. Cady (*Amer. Dyestuff Rptr., 33 (1944), No. 2, pp. P29-P32*).—This account summarizes in chronological order the most important researches on sun fading, on artificial light sources as substitutes for the sun, and on the development of standards for assessing the degree of fading.

Water-vapor permeability of certain coated fabrics, J. T. Stearn and A. S. Cooper, Jr. (U. S. D. A.). (*Amer. Dyestuff Rptr., 33 (1944), No. 7, pp. 150-156, illus. 2*).—It is pointed out that vinyl polymers, principally the chloride-acetate copolymer and the polyvinyl butyral, have been successfully used in the pro-

duction of a light-coated fabric, requiring relatively little coating material, which presents an outside surface that sheds water but which permits a rather large amount of water to be evaporated through the cloth. The experimental work presented shows that the water-vapor permeability of broadcloth and presumably some other cotton fabrics is reduced only 10–35 percent by suitable coatings which prevent the passage of liquid water even under hydrostatic pressure up to 50 cm. and of any appreciable amounts of air. As an aid in testing these coated fabrics, the permeability cup test was simplified to require only readily available equipment and only a small amount of the operator's time.

Physical properties of 26 work garment fabrics, M. B. Hays. (U. S. D. A.). (*Rayon Textile Mo., 25 (1944), No. 1, pp. 72-74*).—Count, type of warp yarn, weight per square yard, thickness at 1 lb. pressure, breaking strength, loss of weight on desizing, and shrinkage were determined on materials suitable for trousers, slacks, and coveralls, and including gabardines, osnaburgs, poplins, jeans, herringbone twill, whipcords, suitings, pin check, and sportswear denim. Data are included comparing the results of breaking strength determinations by the grab, strip, and the half-grab methods, the latter recently developed by Larose (E. S. R., 88, p. 422). Comparisons of the resistance of the fabrics when abraded on the Taber and Wyzenbeek machines are also reported.

The passing of real silk, A. D. Kelly (*Rayon Textile Mo., 25 (1944), No. 2, pp. 53-54, 55*).—This is an account of the gradual and, since the war, the rapid displacement of silk in various industrial and consumer goods by the synthetic fibers, rayon and nylon in particular.

Factors relating to the selection of sewing thread, F. E. Petzel (*Ohio Sta. Bul. 649 (1944), pp. 14+*).—Four types of thread, including ordinary cotton sewing thread, mercerized cotton thread, heavy duty mercerized cotton thread, and nylon thread were compared with respect to price per 1,000 yd., thread construction, fineness, twist, balance of twist, breaking strength and elongation of thread, seam strength, running quality, suitability for hand sewing, and color fastness to laundering. The ordinary cotton thread, available in black and white only, tended to be the lowest priced type of thread tested. There was not a significant difference in seam strength between the three- and six-cord ordinary cotton threads taken as groups, but the six-cord thread tended to be somewhat superior to the three-cord thread in balance and in elongation at break. The difference in balance did not make noticeable difference in hand or machine sewing, but the greater elongation of the six-cord thread suggested greater durability. The dullness and relatively hard texture of this type of thread made it less suited to use on soft, lustrous fabrics, and the wiriness of some of the silk-finished cotton thread made it difficult to handle. Black thread of both three- and six-cord construction usually faded appreciably. Mercerized cotton thread, although usually higher in price than many brands of ordinary cotton thread, had the advantage of moderately high luster, soft texture, and availability in numerous colors. It was somewhat finer and had a mean seam strength slightly lower than ordinary cotton thread size 50. The relatively poor balance of mercerized cotton thread may have caused the knotting and twisting of the thread in hand sewing. The colors of mercerized cotton thread were fast to laundering. The heavy duty mercerized cotton thread was lustrous and available in a limited range of colors. It cost more than the other types of thread, but was coarser and had the highest thread strength and seam strength of any type of thread tested. Probably because it had better balance than the finer mercerized thread, the heavy duty thread showed only a slight tendency to knot and twist in hand sewing. One brand of red heavy duty thread was the only color of this thread type that faded.

Nylon thread was highest in price, smallest in size, lustrous, smooth, available (at the time of the study) in a variety of colors which were fast, and was second only to heavy duty thread in seam strength. It was difficult to use for hand sewing, however, because of its tendency to unwind at the cut end, to knot, and to twist. Certain variations with brand of thread and with price were observed for the threads tested.

Nylon yarn and its possibilities, G. LOASBY (*Rayon Textile Mo., 24 (1943), No. 12, pp. 53-55, illus. 1; 25 (1944), Nos. 1, pp. 66-68, illus. 7; 2, pp. 55, 56-57, illus. 4*).—This paper, written from the viewpoint of the textile manufacturer, considers the chemical nature of the nylon molecule and the possibilities for modifying this chemical structure in order to modify the properties of the fiber as desired. A definition of nylon agreed upon by various British interests is given, and its properties are considered in some detail under the following headings: Mechanical and thermal properties, moisture affinity, refractive index and degradation of the yarn, electrical properties, fluidity and viscosity measurements, insect and bacterial action, recovery from strain, elasticity measurements, and dyeing properties. These properties of nylon yarn indicate many varied potentialities and suggest among other things that its high strength and elasticity make it ideal for hosiery, and that it will find application in fabrics where strength combined with lightness and low moisture content or quick drying are desired.

REPORTS AND PROCEEDINGS

Proceedings of the Association of Land-Grant Colleges and Universities (*Assoc. Land-Grant Cols. and Univs. Proc., 57 (1943), pp. 269+*).—In addition to the minutes of the general sessions, sections and subsections, and the executive body, including committee reports and abstracts of papers, these proceedings contain memorials to E. D. Ball, L. W. Hartman, G. A. Harter, M. Jacob, C. E. Ladd, Abby L. Marlatt, W. Newell, and J. J. Wilmore and the following addresses: The Lost Battalion, by E. E. Day (pp. 24-31); Fundamentals of the 1944 Wartime Food Management Program, by M. Jones (pp. 32-40); Agriculture in the Post-War Period, by C. R. Wickard (pp. 41-47); Agricultural Research in the War and After, by E. C. Auchter (pp. 48-59); The Land-Grant Lessons of the War, by J. L. Morrill (pp. 60-67); Education in the Armed Forces, by F. T. Spaulding (pp. 68-71); and Post-War Adjustments in American Higher Education, by O. C. Carmichael (pp. 73-78).

Fifty-sixth Annual Report of the [Michigan Station], 1943, V. R. GARDNER (*Michigan Sta. Rpt. 1943, pp. 135-149*).—This consists mainly of lists of the publications and active projects of the year.

Forty-fourth Annual Report [of New Mexico Station, 1943] F. GARCIA (*New Mexico Sta. Rpt. 1943, pp. 63, illus. 3*).—In addition to sections abstracted on pages 356 and 364, this report gives data on ranch organization and management practices in southeastern New Mexico; production planning to meet war needs; perennial weed control; cotton varieties, breeding, fertilizers, irrigaton, rotations, and insects and insecticides; alfalfa fertilzers; irrigated pastures for southern New Mexico; grain sorghums under irrigation; dry farming in northeastern New Mexico; pinto bean and onion improvement; revegetation of southwestern ranges; codling moth; potato and onion diseases; control of harlequin cabbage bug and Mexican bean beetle; fiber and saponin of yucca species; milk goat improvement; carotene and ascorbic acid content of chile, sugar beets, and garrambullo berries (*Lycium torreyi*); phenological investigations and variety trials with fruits and vegetables;

biennial pruning of apples; rations for hens in laying cages; effectiveness of ferrous sulfate in prevailing egg-yolk discoloration by cottonseed meal; and inheritance of firm egg albumen.

Science for the farmer: [Fifty-sixth Annual Report of the Pennsylvania Experiment Station, 1943].—Supplement 2 (*Pennsylvania Sta. Bul. 446 (1944), Sup. 2, pp. 10+, illus. 16*).—This supplement contains several articles noted elsewhere in this issue, as well as the following: Less Grain to Feed More Livestock Creates an Urgent Farm Problem, by W. E. Keepper (pp. 1, 10); Putting New Life in Pastures Not a Difficult Job (p. 6); Give Your Pastures an Opportunity To Feed Your Livestock Better, by C. F. Noll and S. I. Bechdel (p. 7); and Electric "Jack-of-All-Trades" Does Numerous Chores for Farm Families, by R. U. Blasingame (pp. 8-9), an account of the use and current consumption of various electrical appliances.

Report of the Puerto Rico Experiment Station, 1943, K. A. Bartlett (*Puerto Rico Sta. Rpt. 1943, pp. 38+*).—This report, noted elsewhere in this issue, notes progress in field studies with *Chinchona;* agronomic and propagation studies with *Derris elliptica* and *Lonchocarpus nicou;* field studies with yams and soybeans; dust treatments v. carbon disulfide fumigation for stored grain; rat control methods; susceptibility of introduced bamboo species to the bamboo powder-post beetle (*Dinoderus minutus*); parasite introductions; preparation of a paint pigment from Nipe clay; bamboo propagation, growth, and utilization; processing studies with essential oils; growth of Chinese ginger in Puerto Rico; production and processing studies with vanilla; soil and moisture conservation; and variety tests with coffee.

Fifty-sixth Annual Report of the South Carolina Experiment Station, [1943], H. P. Cooper et al. (*South Carolina Sta. Rpt. 1943, pp. 173, illus. 44*).—In addition to articles noted elsewhere in this issue, results are presented of research at the main station and substations on trade area studies; "custom work" as a farm enterprise; cotton ginning; labor efficiency and farm income; economic basis of rental agreements; harvesting crotolaria for paper manufacture; changes in occupations of rural young men and women since 1940; increased use of electrical equipment; home canning of foods; vocational interest of high school seniors; public library progress in South Carolina; crop variety tests with cotton, corn, wheat, oats, barley, soybeans, and potatoes; sources of nitrogen for top dressing cotton and for sweetpotatoes; sweetpotato and cotton strain tests; drying cayenne peppers; cross-inoculation with fusarium wilt organisms; corn diseases; effectiveness of reduced doses of Ceresan in control of cotton seedling diseases; cowpea curculio; rice weevil in farm-stored corn; Hessian fly damage in South Carolina; vitamin C content of lima beans; effect of silages on carotene content of milk; sweetpotato meal v. ground yellow corn for hogs; effect of ration on beef; corn silage v. corn and soybean silage as only roughage in milk production; compressing milk products; lespedeza for pountry; fertility in turkeys; soybean oil meal v. cottonseed meal for turkey poults; trichomoniasis in turkeys; limited v. full creep feeding of Angus calves; crossbred v. purebred pigs; vaccination of heifers against Bang's disease; cotton breeding; presquare mopping mixtures for boll weevil; tobacco diseases and insects; goldenrod for rubber; kudzu for dairy cows; vegetable breeding and variety tests; effect of soil acidity and minor elements on potatoes; peanut seed treatment; spraying for downy mildew on cantaloupe; and ammonium sulfate plowed under v. side-dressing application for corn.

The agricultural industry after four years of war, P. R. Viljoen (*Farming in So. Africa, 19 (1944), No. 216, pp. 131-201, illus. 1*).—This report of the Department of Agriculture and Forestry and of the Food Control Organization for

the year ended August 31, 1943, discusses conditions prevailing in South Africa and the measures adopted for their amelioration.

MISCELLANEOUS

Mississippi Farm Research, [March 1944] (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 3, pp. 8, illus. 12*).—In addition to articles noted elsewhere in this issue, this number contains When To Turn Bur Clover, by R. Cowart (pp. 1, 2); Weather Notes for February, by R. Woodburn (p. 1); Hodo, New Sorghum for Sirup, Described, by W. S. Anderson (p. 1); Controlling Garden Insects, by C. Lyle (pp. 1, 2); Use Ammonium Nitrate With Assurance, by R. Cowart (p. 2); and Control of Weeds and Grasses in Cotton by Flaming, by J. W. Neely and S. G. Brain (p. 8), also to be issued as a circular.

Bimonthly Bulletin, North Dakota Agricultural Experiment Station, [March-April 1944] (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 4, pp. 43, illus. 5*).—In addition to several articles noted elsewhere in this issue, this number contains The New Mida Wheat Variety, by R. L. Waldron (p. 9); "Antifreeze" in Insects, by H. S. Telford (p. 18); Land Market Activity in North Dakota—4th Quarter, 1943, by R. L. Berger (pp. 19-21) (coop. U. S. D. A.); Agricultural Security in the Northern Plains, by H. L. Walster (pp. 22-26); North Dakota Farm Prices, by P. V. Hemphill (pp. 37-39); and North Dakota Prices of Farm Products, by K. Kienholz (pp. 40-43) (U. S. D. A.).

[Abstracts of publications] (*Texas Sta. Cir. 103 (1943), pp. 20, 21, 28*).—These abstracts include Cotton Gin Profit Charts, by W. E. Paulson (p. 20); Report of the Referee on Fertilizers, by G. S. Fraps (p. 21); Attenuation of *Phymatotrichum omnivorum* Cultures by Repeated Transfer of Young Mycelium, by W. N. Ezekiel (p. 21); Pantothenic Acid Content of Pollen, by P. B. Pearson (p. 28); and Strength and Weakness of the Cooperative Gin Movement, by W. E. Paulson (p. 28).

Farm and Home Science, [March 1944] (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 1, pp. 12, illus. 14*).—In addition to several articles noted elsewhere in this issue, this number contains Clean Yards, Sheds, and Barns—First Requisites for Production of Clean Milk, by G. Q. Bateman (pp. 2-3); and Winter-Range Research at the Desert Branch Experimental Range, by G. Stewart and S. S. Hutchings (pp. 6-8).

NOTES

California University.—*Science* announces that a school of veterinary medicine is to be established at Davis, $500,000 having already been appropriated by the legislature with an additional $500,000 expected from post-war building funds provided by the State. The school will be set up in the College of Agriculture and coordinated with work in agriculture, forestry, and home economics.

Dr. Ralph E. Smith, the oldest staff member in the College of Agriculture in years of service, retired June 30. Dr. Smith became connected with the university in 1903 after 10 years in the department of botany of his Alma Mater, the Massachusetts College, and is believed to have instituted the first distinctive division of plant pathology in this country.

Connecticut University and Storrs Station.—Dean and Director Edwin G. Woodward died July 9 following injuries received in the circus fire at Hartford. Born in Brunswick, Mo., on April 7, 1890, and a graduate of the University of Missouri in 1911, he had served as assistant in dairying in that university from 1911 to 1913; as adjunct professor, assistant professor, associate professor, and professor in dairying in the University of Nebraska in 1913-17; and as professor of dairying in the University of Nevada in 1917 and the Washington College from 1917 to 1922. Subsequently he was engaged in farming and the breeding of Guernsey cattle in Connecticut, returning to university work as dean of the College of Agriculture and director of agriculture in 1939.

Vice Director W. L. Slate has been designated as acting director of the station.

Kansas College and Station.—Dr. C. W. McCampbell, who recently retired as administrative head of the department of animal husbandry in order to teach and carry on research, has been succeeded by Dr. A. D. Weber. Dean James E. Ackert of the graduate school has also been made head of the department of zoology vice Dr. Robert K. Nabours, who will give full time to research. The department of anatomy and physiology in the School of Veterinary Medicine has been divided following the retirement of its head, Dr. J. H. Burt; Dr. W. M. McLeod becomes head of the department of anatomy and Dr. E. E. Leasure, head of department of physiology.

Kentucky University and Station.—Arrangements have been made to test on a commercial scale the new aromatic type of tobacco that has been developed by the department of agronomy. This aromatic tobacco is considered an important discovery and may give a materially larger value for Kentucky-grown tobaccos. Selected growers in the State will produce the tobacco for and on behalf of the station.

Mary L. Didlake, associate entomologist and botanist, reached retirement age and was given a new assignment on July 1. Recent appointments include Paul M. Pinney as assistant in farm management studies; Paul D. Bailey as assistant in agronomy; and Dr. Herbert W. Patton as assistant veterinarian. Dr. L. F. Bailey, assistant chemist, has resigned to accept a position with the T. V. A. Other resignations include Jean Beiter, instructor in home economics, and Fred Boyd, State farm labor assistant. Ernest J. Nesius, assistant in farm management, has been granted leave of absence for service in the United States Navy.

Maryland University.—The death, in his seventieth year, is noted of Dr. Franklin B. Bomberger, associated with the instruction and extension work of the institution for about 33 years. A native of Maryland and a graduate of the uni-

★ U. S. Government Printing Office 1944:—597460

versity in 1894, he had taught English and civics there from 1900 to 1912 and economics from 1912 to 1914, and served as dean of rural economics from 1914 to 1917. He then became assistant director of the extension service and specialized in rural organization, resigning this position in 1933 to become president of the Baltimore Bank for Cooperatives but returning in 1942 as extension assistant professor of marketing.

Massachusetts College and Station.—Dr. Raymond T. Parkhurst, head of the department of poultry husbandry, has resigned to become director of research and nutritional service for a milling company in Pennsylvania.

Minnesota University and Station.—Dr. H. J. Sloan, professor of poultry husbandry and poultry husbandryman, returned to active duty on July 1 following 6 months' leave for special study at the University of Chicago.

Missouri Station.—The station has worked out a special spray program for family fruit plantings, methods for improved pasture utilization, fertilizer recommendations for spring and summer crops in 1944, and a special wartime chick starter and growing mash making considerable use of plant proteins. Three seasons' work with hormone sprays on snap beans have indicated limitations in both cool and hot weather as well as other objections. A cotton variety improvement program has increased average acre yields to 570 lb. of lint cotton on a 409,000-acre basis. An egg stabilization and pasteurization process is being used on a commercial scale, producing one carload a day for Army use. A new straw-loft calf barn has greatly improved ventilation, so that since 1939 there have been no deaths from pneumonia. A large demand is noted for plans developed by the station for building homemade push rakes and transport rakes.

Rutgers University and New Jersey Stations.—A separate department of microbiology has been established with Dr. S. A. Waksman, previously professor of soil microbiology and microbiologist, as its head.

Cornell University and Station.—Following a request of Dr. L. H. Bailey, the name of the Cornell Arboretum has been changed to the Cornell Plantations. Dr. Bailey is to serve as chairman of the policy committee to work out details for an enlargement of scope whereby in addition to the usual plant collections there will be included all things that grow, animals as well as plants, the idea being to constitute a great educational program designed to embody a whole series of enterprises based upon the land.

Recent appointments as professors emeritus include the following widely known personnel: Bristow Adams, editor of publications since 1914; J. A. Bizzell, professor of plant technology since 1912, and for 9 years previous assistant chemist and assistant professor; T. H. Eaton, professor of rural education since 1920; and C. H. Myers, professor of plant breeding since 1913. Dr. Ruby Green Smith, extension professor of home economics and State leader of home demonstration agents, has retired after 26 years' service and has been succeeded as State leader by Frances Scudder, assistant State leader. Mary G. Phillips has been appointed bulletin editor for the College of Home Economics.

EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY AND MICROTECHNIC

Factors influencing the yield, composition, and quality of raisins, H. E. JACOB (*California Sta. Bul. 683 (1944), pp. 44, illus. 1*).—The author defines the various types of raisins and currants and their size and quality standards and proceeds to the discussion of experiments with 12 methods of drying, 8 of which are or have been commercially important, made to determine the influence of grape maturity and drying method on the yield and composition of Thompson Seedless and Muscat raisins. Yield with Thompson Seedless was proportional to the Balling degree of the fresh grapes. Seeds in the Muscat cause the increase in yield to lag slightly behind that indicated by the Balling degree of the grape juice. With both varieties, as grape maturity advanced there was an increase in the size of the raisins, the weight per unit volume, and the sugar content of the raisins; a decrease in the acid and insoluble-solids percentages. The changes in sugar and insoluble solids in the raisins nearly ceased when the grapes reached 23° or 24° Balling, but the percentage of acid continued to decrease slowly. As the grapes ripened, percentages of calcium and magnesium remained constant in the raisins of both varieties; that of phosphorus appeared to decrease; that of potassium was constant in Thompson Seedless, but decreased slightly in Muscat. Quality improved as the grapes ripened, the change in the natural sun-dried product being the most marked. The color of the fresh grapes markedly influenced the color of such light-colored raisin types as golden-bleached, sulfur-bleached, and Australian-type sultana. Drying methods involving dehydration or a hot dip produced slightly higher yields of raisins having slightly higher sugar content and lower insoluble-solids content than did other methods. Bleaching the grapes with sulfur dioxide increased the acid content of the raisins. Close correlation between the quality of natural Thompson Seedless raisins and the acid content and the weight per unit volume was indicated. The two latter measurements in samples from 50 commercial lots also agreed well. With light-colored types, neither of these measurements proved to be a good quality index because of the very high value attached to the hue and brilliancy of the color. Sugar content cannot be used as an index to raisin quality because the differences involved are too small.

Chemical changes of the papaya plant during development, with special reference to its proteolytic activity, C. F. ASENJO, D. H. COOK, M. DEL C. DE FERNÁNDEZ and L. A. ALVAREZ (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27*

[1]The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

(*1943*), *No. 1, pp. 1–15, illus. 1; Span. abs., p. 6*).—With the exception of the seed, all parts of the papaya plant showed varying degrees of proteolytic activity. Milk clotting activity appeared first in the leaf and later in the stem and root. The greatest proteolytic activity was concentrated in the green fruit rind. Decreasing activity was found in the leaf, fruit pulp, stem, and root. In the leaf, and, to a lesser extent, in the stem and root, a definite variation took place in proteolytic activity during the 13 initial months of growth, maximum activity having been reached between the fourth and ninth months. Data regarding the moisture, H-ion concentration, and nitrogen content of the various parts of the papaya plant during its initial 13 mo. of growth were collected.

The isoelectric point of asclepain, D. C. CARPENTER and F. E. LOVELACE. (N. Y. State Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 12, pp. 2364–2365, illus. 1*).—The proteolytic enzyme obtained from the latex of the common milkweed, *Asclepias speciosa,* was isolated by the authors of the present paper from the roots of *A. syriaca* and subjected to electrophoresis experiments. The electrophoretic velocity of asclepain was measured in citrate, acetate, and phosphate buffer solutions in the pH range 1.8 to 8.0 and the electrical charge on the particle calculated. The isoelectric point of asclepain was found to be at pH 3.11.

The development of brown color in milk products ([*New York*] *Cornell Sta. Rept. 1943, pp. 110–112*).—Browning, and, to some degree, at least, the development of "cooked flavor" in concentrated or heated milk products, appeared to be due primarily to chemical reactions between the sugar and proteins of milk. Casein and lactose appeared to interact with each other in stoichiometric proportions to form a series of products of somewhat different properties. This interaction and the development of the brown color in milk can be inhibited by treatment with certain oxidizing and reducing agents; bisulfite is especially effective. Casein treated with formaldehyde does not react with lactose, but if the casein is subsequently freed from the formaldehyde it will react with lactose. When spray-dried milk is stored at a high humidity it becomes insoluble, and the casein isolated from this product has a reduced nitrogen content, indicating a combination with lactose. It is believed that the formation of this compound and the browning of milk cannot be explained on the basis of simple absorption, nor as an amino-aldehyde condensation. The reaction between proteins and reducing sugars appears to be general; all reducing sugars tested, monosaccharides and disaccharides, reacted with casein. Likewise, lactose was found to react with all proteins tested. Some aldehydes, but not all, also react with casein when heated, forming brown, insoluble compounds.

A possible non-enzymatic mechanism of changes occurring in the pectic substances and other polysaccharides in living plants, Z. I. KERTESZ. (N. Y. State Expt. Sta.). (*Plant Physiol., 18 (1943), No. 2, pp. 308–309*).—The author briefly notes the observation that dilute solutions of hydrogen peroxide rapidly degenerate dissolved pectin even in the absence of ascorbic acid. The pectin loses its typical colloidal properties, becomes soluble in 70 percent alcohol, and is transformed into a substance not to be classified as pectic. It is held likely that this reaction with hydrogen peroxide is not typical for pectin and starch alone, but that it will also be observed with other polysaccharides. It is suggested that some of the changes in the polysaccharides and pectic constituents of plants in situ may be the result of the action of peroxides on these substances. Although the presence of peroxides in plants has never been conclusively demonstrated, it has been shown that a number of dehydrogenase systems are capable of forming hydrogen peroxide, in vitro, at least, and that many reactions which necessitate the assumption of the presence of peroxides in the tissue occur in plants. Attention is directed, in this connection, to the fact that hydrogen peroxide apparently

occurs among the reaction products during the nonenzymatic decomposition of ascorbic acid.

A system of analysis for plant tissue by use of plant juice, F. S. SCHLENKER. (R. I. Expt. Sta.). (*Plant Physiol., 18 (1943), No. 2, pp. 141–150*).—The author points out that utilization of expressed plant juice for determining the chemical constituents of a plant has the advantage of presenting the products of metabolism in a state more similar to that found in living tissue than any of the more commonly used extraction methods. He describes methods for the determination of a portion of the inorganic and organic constituents in plant juice extracts and calculation of the results on a fresh weight basis.

With respect to the preparation of the plant tissue sample and the obtainment of the juice used for subsequent determinations, the author found that grinding is apparently adequate for all circumstances, its only evident disadvantage, in comparison with freezing or autoclaving, being that the resulting juice contains much debris and protein. When proteins had to be removed, their partial elimination by freezing or autoclaving proved helpful. Following discussion of the principles upon which choice of the various methods was based, he states working detail of methods for preparation of standards, preparation of sample, and determination of total soluble nitrogen, nitrate nitrogen, ammonia nitrogen, clarification of juice sample for the determination of amide and α-amino nitrogen, amide nitrogen, amino nitrogen, clarification of juice for the sugar determination, determination of total sugar, reducing sugar, and non-sugar-reducing substance.

Most of the procedures are applicable to other types of plant extracts. The nitrate and sugar methods, however, are not to be used with alcohol or water extracts if a visual colorimeter is used, because the precipitating reagents involved do not give the necessary colorless filtrates.

The ternary systems barium chloride-dioxane-water and calcium chloride-dioxane-water, H. F. BOGARDUS and C. C. LYNCH. (Univ. Del.). (*Jour. Phys. Chem., 47 (1943), No. 9, pp. 650–654, illus. 3*).—The 25° C. isotherms for the systems barium chloride-dioxane-water and calcium chloride-dioxane-water have been presented and were measured, and a new solvate, $CaCl_2 \cdot (C_4H_8)_2O_2 \cdot 2H_2O$, was separated and identified.

The electrochemical properties of clay minerals and the differentiation of hydrogen clays and hydrogen bentonites by electrochemical methods, I, II (*Jour. Phys. Chem., 47 (1943), No. 8, pp. 543–549, illus. 5; 549–553, illus. 4*).—These two papers deal, respectively, with kaolinite and clays showing kaolinitic characteristics and with montmorillonitic clays and bentonites.

I. *Kaolinite and kaolinitic clays,* J. N. Mukherjee and R. P. and D. K. Mitra.—This paper takes up briefly the titration curves, buffer capacities, and base-exchange capacities of the mineral kaolinite and of hydrogen clays prepared from the entire clay fraction of two lateritic soils which gave dehydration curves showing features characteristic of kaolinitic minerals.

II. *Montmorillonitic clays and bentonites,* R. P. Mitra, S. N. Bagchi, and S. P. Ray.—The titration curves and other features of one hydrogen clay and two hydrogen bentonites which gave dehydration curves similar to those of montmorillonitic clay minerals are presented. The hydrogen clay and the two hydrogen bentonites were prepared, respectively, from the entire clay fraction of a neutral calcareous soil from Padegaon (Bombay), a bentonite from Hati-Ki-Dhani, and another bentonite from Bhadres.

Gliotoxin, the antibiotic principle of Gliocladium fimbriatum.—I, Production, physical and biological properties, J. R. JOHNSON, W. F. BRUCE, and J. D. DUTCHER. (Cornell Univ.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 10, pp. 2005–2009, illus. 2*).—The production of gliotoxin, the powerful bacteriostatic agent

of *G. fimbriatum,* is described. The empirical formula and molecular weight were revised. The crystal form, solubility, ultraviolet absorption curve, and optical activity were determined. The close similarity between the absorption curves for tryptophan and gliotoxin led to the inference that an indole nucleus may be present in gliotoxin. It exerted a high degree of bacteriostatic action on a variety of animal and plant pathogenic organisms. Its action on higher animals is recorded.

X-ray fiber pattern from amylose with a glycerol plasticizer, R. E. RUNDLE and L. W. DAASCH. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 11, pp. 2261–2262, illus. 1*).—The use of a plasticizer to aid in the stretching of the amylose films markedly modified the X-ray fiber diagrams. Alcohol-precipitated starch, the "V" modification, is found to have a helical structure and a periodicity along the helix of 8 a.u. The optical properties of this material indicate that the greatest polarizability is normal to the helix axis or normal to the long axis of the molecule. The greatest polarizability of the glycerol-amylose fiber is parallel to the fiber axis. The chains are probably extended linearly rather than possessing the helical configuration of the V modification, but they must be folded, less extended than in the "B" modification, as indicated by the difference in the fiber spacings.

Effect of concentration and pH on the viscous and electrochemical properties of hydrogen bentonites, J. N. MUKHERJEE, N. C. SEN GUPTA, and M. K. INDRA (*Jour. Phys. Chem., 47 (1943), No. 8, pp. 553–577, illus. 15*).—Specific conductivity of dilute suspensions of hydrogen bentonites at first increases linearly with increase of concentration, then rises much more rapidly, the curve being convex to the concentration axis, after which the slope again diminishes. Λ (conductivity per gram of colloid) at first showed a small variation, indicating that it is approximately constant within the limits of experimental error, then rapidly diminished and ultimately passed through a minimum. The cataphoretic velocity increased with the concentration and passed through a maximum at a cencentration approximately the same as that at which Λ passed through a minimum. The pH changed proportionately with $-\log C$ (C=concentration in grams/100 cc.) The conductivity per gram of colloid calculated from the H-ion concentration was appreciably greater than Λ.

The extinction coefficient at first diminished with concentration, then passed alternately through a minimum and a maximum. Similar variations of the extinction coefficient with time were observed during slow coagulation of hydrogen bentonites. The coefficient of viscosity increased more rapidly with concentration than would be expected from a linear relationship. The apparent specific gravity increased with concentration to a constant value, agreeing fairly well with that of the specific gravity of dry bentonite as measured in toluene.

Studies on 4-hydroxycoumarins, I-III. (Wis. Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 12, pp. 2285–2287, 2288–2291, 2292–2296*).—This series of papers is concerned with compounds related to 3,3′-methylenebis-(4-hydroxycoumarin), the causative agent of the hemorrhagic sweetclover disease of cattle, which is readily synthesized by condensing formaldehyde with 2 M equivalents of 4-hydroxycoumarin.

1. *The synthesis of 4-hydroxycoumarins,* M. A. Stahlmann, I. Wolff, and K. P. Link.—The first paper describes an improved synthesis of 4-hydroxycoumarin from methyl acetylsalicylate and the application of this method of preparation to the synthesis of nine 3-substituted-4-hydroxycoumarins from acylated derivatives of methyl salicylate.

II. *The condensation of aldehydes with 4-hydroxycoumarins,* W. R. Sullivan, C. F. Huebner, M. A. Stahmann, and K. P. Link.—Paper 2 reports upon a synthesis in which 4-hydroxycoumarin was condensed with several aliphatic and aromatic aldehydes. It was found that the 3,3′-arylidenebis-(4-hydroxycoumarin)s

from two *o*-hydroxybenzaldehydes undergo spontaneous dehydration and ring closure to form substituted benzopyrans. Colored "intermediate" compounds representing the condensation of 1 molecule of *o*-hydroxybenzaldehyde with 1 molecule of 4-hydroxycoumarin were obtained in these two instances. 4-Hydroxycoumarin adds to 3-(*o*-hydroxybenzal)-2,4-diketochroman on heating in ethanolic solution without the addition of a catalyst. 3-(*o*-Hydroxybenzal)-2,4-diketochroman is converted to 3-[6-oxo(1)benzopyrano(4,3-*b*)-(1)-benzopyran-7-yl]-4-hydroxycoumarin when heated in ethanolic solution.

III. *Dehydration of the aldehyde condensation products,* C. F. Huebner, W. R. Sullivan, M. A. Stahmann, and K. P. Link.—The aldehyde condensation products of 4-hydroxycoumarin were dehydrated to form substituted 1,4-pyran derivatives. the 3,3′-alkylidene-4,4′-epoxydicoumarins and 3,3′-arylidene-4,4′-epoxydicoumarins. This transformation was induced by acetic anhydride in pyridine, with all except the simpest member of the series, 3,3′-methylenebis-(4-hydroxycoumarin). 3,3′-Methylenebis-(4-hydroxycoumarin) was dehydrated to the 1,4-pyran derivative by fusing with potassium acid sulfate, by heating with red phosphorus and iodine, or by treatment with diphenylphosphoric acid chloride. Various monosubstituted 3,3′-methylenebis-(4-hydroxycoumarin)s yielded the dehydration product. On heating the monomethyl ether, monobenzoate, or mono-(dimethylphosphate), and treating the last two products with sodium methoxide, all yielded the dehydration product. Monomethyl ethers resulted when the 1,4-pyran ring was opened by treating the dehydration product with sodium methoxide.

Some derivatives of lonchocarpic acid, H. A. Jones and H. L. Haller. (U. S. D. A.). (*Jour. Organic Chem., 8 (1943), No. 5, pp. 493–496*).—Catalytic hydrogenation of lonchocarpic acid, obtained in an examination of a *Lonchocarpus* species for its possible rotenone content, produces a tetrahydro derivative and acetylation yields a diacetyl derivative. In ether solution lonchocarpic acid with diazomethane yields a monomethyl derivative, in methanol with the same reagent a dimethyl compound. On oxidation with hydrogen peroxide lonchocarpic acid yields *p*-hydroxybenzoic acid. Lonchocarpic acid is probably an acidic phenol.

The hydrogenation of 3-methylcyclopentane-1,2,4-trione, M. Orchin and L. W. Butz. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 12, pp. 2296–2299*).—2-Methylcyclopentane-1,3-dione and 4-hydroxy-2-methylcyclopentane-1,3-dione were prepared by the catalytic hydrogenation of 3-methylcyclopentane-1,2,4-trione. The two isomeric enol methyl ethers were prepared from the hydroxydione, and a third acidic methyl derivative was obtained. This may be 4-methoxy-2-methylcyclopentane-1,3-dione. When heated with potassium bisulfate, the hydroxydione did not give a methylcyclopentene-3,5-dione, but a crystalline dimer, possibly containing the dicyclopenta-*p*-dioxin nucleus.

The hydrolysis of nicotinonitrile by ammonia, C. F. Krewson and J. F. Couch. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 11, pp. 2256–2257*).—By carrying out the hydrolysis in a glass bulb enclosed, together with additional ammonium hydroxide, in a steel bomb and heated for 12 hr. at from 107° to 109° [C.], the authors obtained a mixed product of which 80.5 percent was nicotinamide, the remainder nicotinic acid. The yield of the amide was 72.66 percent. Adding sodium hydroxide to the reaction mixture made the reaction much more rapid but lowered the yield of amide and increased that of the free acid. The addition of hydrogen peroxide increased the yield markedly but the product was of lower purity.

It is noted that the observation of ammonium hydroxide hydrolysis of nitriles to the corresponding amides without the use of hydrogen peroxide may make it possible to obtain amides from nitriles oxidized or polymerized by the peroxide.

A new form of crystalline xylitol, J. F. Carson, S. W. Waisbrot, and F. T. Jones. (U. S. D. A.). (*Jour. Amer. Chem., 65 (1943), No. 9, pp. 1777–1778*).—In contrast with the hygroscopic crystalline form of this compound, having a melting point of from 61° to 61.5° [C.], the authors obtained, by concentration under diminished pressure of the solution resulting from the preparation of xylitol from *d*-xylose to a clear viscous sirup, a hard, crystalline mass after it stood overnight. Recrystallization from either methanol of ethanol yielded colorless crystals melting at 93°–94.5°. From a sample of fused xylitol either type of crystal could be obtained by seeding with the proper nuclei, but the low-melting form changed in a few days into the high-melting and stable form on exposure to the air of the laboratory. Crystallographic data are given.

Conversion of globular to oriented fibrous proteins.—I, By heat and mechanical working, F. R. Senti, C. R. Eddy, and G. C. Nutting. (U. S. D .A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 12, p. 2473*).—In its essentials, the process described involves heating the protein with water, followed by mechanical treatment, such as stretching in cold or hot water or water vapor, to extend and orient the peptide chains. Among the proteins which have thus given β-keratin patterns are casein, β-lactoglobulin, hemoglobin, ovalbumin, edestin, zein, and peanut and soybean proteins. A high degree of double orientation was achieved in an ovalbumin preparation. The authors consider that their results demonstrate that the conversion of globular to oriented fibrous proteins may be expected to be generally practicable. Tensile measurements showed that the strength of casein, lactoglobulin, and ovalbumin filaments is greatly increased by conversion of the protein to the oriented fibrous form. It is believed that an extension of this work may lead to significantly improved protein plastics, films, and adhesives.

Equilibrium measurements by infrared absorption for the formation of nitric acid from oxygen, water vapor, and nitrogen dioxide, E. J. Jones. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 12, pp. 2274–2276, illus. 3*).—The author made a direct determination of the equilibrium constant for the reaction $H_2O(g) + NO_4(g) + 1/2O_2(g) \rightarrow 2HNO_3(g)$, using the infrared absorption of nitric acid vapor at 1.4μ as a method of analysis. Transmission values of nitric acid and nitrous acid in the 1.4μ region are given.

Conversion of lutein in a boric acid-naphthalene melt, I, L. Zechmeister and J. W. Sease (*Jour. Amer. Chem. Soc., 65 (1943), No. 10, pp. 1951–1955, illus. 6*).—Lutein (xanthophyll ex *Tagetes*), $C_{40}H_{56}O_2$, when melted with boric acid in the presence of naphtalene gives rise to a mixture of new polyenes which can be separated chromatographically. The three main conversion products, each containing one oxygen atom, were crystallized. Their main characteristics are described and some structural features are discussed. The extinction curve of one shows only one maximum in the visible region, while the fundamental band of each of the other two has the fine structure of the lutein curve. On iodine catalysis trans-cis changes occur and a "cis-peak" appears in all three instances.

The molecular structure of fibers made from native egg albumin, K. J. Palmer and J. A. Galvin. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 11 pp. 2187–2190, illus. 1*).—Fibers made from native egg albumin by a process which involves formation of a complex with a detergent and drawing under steam are shown to be composed of parallel bundles of polypeptide chains running parallel to the fiber axis. The peptide chains are shown to have the β-keratin configuration, as is evident from the similarity of appearance between the X-ray pattern obtained from the albumin fibers and those obtained from well oriented β-keratin. The tensile strength of the synthetic pure protein fiber is shown to be dependent upon the degree of molecular orientation and to reach a value of 38,000 lb. per square inch.

Tests and standards for shark liver oil from sharks caught in Florida waters, L. L. Rusoff and R. M. French. (Univ. Fla. et al.). (*Fla. Acad. Sci. Proc., 5 (1940), pp. 133–135*).—A description and tests proposed for this product include the following: Shark-liver oil is an amber to brown oily liquid, possessing a fishy odor and taste, insoluble in water, slightly soluble in alcohol, and soluble in chloroform, ether, benzene, ethyl acetate, and carbon disulfide. A solution of 1 drop of the oil in 1 cc. of chloroform, when shaken with 1 drop of sulfuric acid, acquires a light violet color, changing to purple and finally violet blue or brown. Equal parts of benzene and oil centrifuged for 25 min. at 25° C. form a clear solution and no precipitate.

The specific gravity, refractive index, cold test, free acid, nonsaponifiable matter, saponification value, and iodine value for the liver oils of sand shark, lemon shark, dusky shark, and for blended oil are tabulated.

The synthesis of compounds related to the sex hormones, W. E. Bachmann, R. A. Gregg, and E. F. Pratt (*Jour. Amer. Chem. Soc., 65 (1943), No. 12, pp. 2314–2318*).—A method developed for the preparation of key intermediates in the synthesis of estrone-a was extended to the preparation of several analogs of equilenin, including *x*-norequilenin. Two compounds containing a six-membered D ring were also prepared. One of these is a structural isomer of equilenin.

Rotenone in the yam bean (Pachyrrhizus erosus), L. B. Norton. (N. Y. State Expt. Sta.). (*Jour. Amer. Chem. Soc., 65 (1943), No. 11, pp. 2259–2260*).—The author isolated rotenone amounting to about 0.1 percent of the original beans. The total material giving the red color test, however, was 0.15 percent, calculated as rotenone. It is probable that rotenone itself accounts for a substantial proportion of the color tests reported, but not fully for either the toxicity or the red color test of the yam bean. A number of other compounds, still under investigation, were also isolated, some giving the color test and some showing definite toxicity to insects.

Scandenin—a constituent of the roots of Derris scandens, E. P. Clark. (U. S. D. A.). (*Jour. Organic Chem., 8 (1943), No. 5, pp. 489–492*).—In the roots of *Derris scandens* the author found no rotenone, but a new substance, scandenin, $C_{26}H_{26}O_6$, was found. Lonchocarpic acid and possibly robustic acid were also identified.

Scandenin was shown to be isomeric with lonchocarpic acid, and to contain one methoxyl, two free hydroxyl groups, and probably a *p*-hydroxybenzoyl group. Its acidic character is tentatively attributed to a phenolic hydroxyl group.

Deposition and retention of sprays.—III, Apparatus and methods for laboratory spraying, D. E. H. Frear (*Pennsylvania Sta. Bul. 463 (1944), pp. 18+, illus. 9*).—This is a continuation of a series previously noted (E. S. R., 84, p. 496). In the method here described, synthetic surfaces attached to a rotating turntable are sprayed with an atomizer-type sprayer, to which is attached an overhead reservoir containing the spray suspension. The effects of time, pressure, concentration of toxicant, and type of sprayer were investigated in connection with the performance of the apparatus, and the method finally evolved was found to give accurate and reproducible results. The plates sprayed by this method may be readily subjected to artificial weathering tests, and retention coefficients calculated. Typical results are given.

With respect to choice of a receiving surface suitable for the experimental sprayings, it was found that glass plates, when chemically clean, were so easily wetted as not to correspond to most natural surfaces. Cellulose acetate and cellulose nitrate sheets were also extensively tested, and the latter was found to be the most suitable material. The droplet patterns on sheets of this substance were comparable to those observed on many natural surfaces; it was available in quantity at a reasonable cost,

and lots bought at various times were found very uniform. The commercial material is available in sheets 20 by 50 in. It was cut into plates 5 by 5 in. just before use. Rubber gloves were always used in handling and cutting the sheets to avoid contamination. When ready for analysis, the sprayed plates were trimmed to exactly 10 by 10 cc., and all analyses are expressed on the basis of 100 cc. of surface.

Though the quantity of spray discharged per minute increased at a gradually diminishing rate per pound of air pressure, the quantity of spray deposited on the test surfaces increased with the pressure, up to about 80 lb. per square inch, and dropped at higher air pressure.

With reference to the effect of duration of spraying, results indicate that spraying beyond the point of runoff may produce quite variable quantities of deposit. Retention of spray material under washing tests simulating rainfall to the extent that the water was applied from an atomizer nozzle showed that, in general, the deposits of most of the less adhesive materials are reduced to roughly one-third after washing with 3,500 cc. of distilled water. In comparison with the other materials tested, bordeaux mixture exhibited a high degree of retention. Two commercial basic copper sulfates were retained to a less extent, and lead arsenate least of all.

Modified Hershberg melting-point apparatus, M. M. Graff. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 15 (1943), No. 10, p. 638, illus. 1*).—Radiation from an infrared drying bulb of 105–120 v. and 250 w., placed within a metal container sufficiently ventilated to allow for heat dissipation, is focused on the heating chamber of the melting-point bath. The chamber consists of a flattened portion of the Thiele tube made by sealing two 6-cc. pyrex petri dishes into the tube. The limiting temperature is about 150° C. A higher temperature could be attained by using two heating units, one on either side of the heating chamber, or by using lamps of higher wattage. The heating is controlled by means of a variable-voltage transformer.

pH measurements on thixotropic gel systems using the glass electrode, R. C. Vogel and M. W. Lisse. (Pa. State Col.). (*Jour. Phys. Chem., 47 (1943), No. 9, pp. 678–685*).—It was found that during the primary gelations ferric hydroxide and thorium molybdate gel-forming systems showed pH changes, but a bentonite system showed none. During the thixotropic liquefaction there was no pH change within the limits of experimental error in the cases of a thorium molybdate, a ferric hydroxide, and a bentonite gel. During the secondary gelation there was no change in pH within the limits of experimental error in the cases of a thorium molybdate, a ferric hydroxide, and a bentonite system.

Viscometric estimation of particle dimensions, I, II, J. P. Hollihan and D. R. Briggs. (Minn. Expt. Sta.). (*Jour. Phys. Chem., 46 (1942), No. 6, pp. 685–693, illus. 2; 47 (1943), No. 1, pp. 30–39, illus. 3*).—The data discussed in these two papers were derived from studies of concentrations up to 4 percent of the respective solutes in carbon tetrachloride.

I. *The system stearic acid-carbon tetrachloride.*—Relative viscosities were determined with a probable error of 3 parts in 10,000 for 0.000–4.000 percent stearic acid-carbon tetrachloride solutions. The determinations were made at a low rate of flow. A simple procedure for carrying out a rate of flow study is described.

It is shown that the viscosity data are in almost perfect agreement with the complete Einstein equation (the power series of which the equation as ordinarily stated is the first term only), a concordance which is taken as strong evidence for the conclusion that the stearic acid molecules assume a spherical shape in carbon tetrachloride. Some aggregation is indicated. The calculated partial specific volume, 1.41, is about 30 percent higher than the specific volume in the dry state. The conclusion that the particles are spherical appeared to be valid over the range of flow rates studied.

II. *Micellar changes involved in the heat-bodying of tung oil.*—It is shown that viscosity data for dilute carbon tetrachloride solutions of tung oils which had undergone various degrees of nonoxidative heat treatment can be interpreted as indicative of a progressive increase in degree of asymmetry of the oil micelles with time of bodying. These data can also be satisfactorily represented by the exponential form of the Einstein equation for spherical particles. In the latter instance a progressive increase in the viscometrically effective partial specific volume of the oil micelles (in carbon tetrachloride) is indicated. Evidence in favor of the suggestion that the bodying process occurs in successive stages is presented. No conclusions regarding possible gelation mechanisms are drawn.

Theories of image formation in the microscope, H. Moore (*Jour. Roy. Micros. Soc., 60 (1940), No. 3, pp. 140–151, illus. 1*).—This paper presents an important summing up of the arguments for and against the Abbe Theory of image formation in the microscope as a pure interference phenomenon. The author points out that up to 1875 (when the first account of the Abbe Theory appeared) resolving power and its bearing on image formation appear to have been virtually ignored. He proceeds to a statement and exposition of the Abbe Theory and of its limitations as brought out theoretically and experimentally by numerous microscopists and physicists (E. M. Nelson, Helmholtz, Lord Rayleigh, Wolfke, Von Laue, Berek, the author of the present paper, and others). He concludes with a clear, mainly nonmathematical exposition of Berek's "Consonance-Dissonance" Theory of microscopic image formation, noting briefly some experiments of his own which are fully in accord with Berek's findings. "This theory [Berek's] avoids the obvious errors of the Abbe Theory in that, while recognizing the existence of the Abbe interference effects, it relegates them to their proper position as a phenomenon which is of no importance in microscope practice but which becomes undesirably prominent when the illuminating cone is of very small angle. The theory also avoids the difficulties which are met with if the Equivalence Theory is applied too freely (i. e., without due regard to the 'suitable conditions of illumination' which must be satisfied to ensure complete equivalence) by drawing particular attention to residual interference effects which must necessarily become visible in the image if the equivalence conditions are not properly observed. . . . The Consonance-Dissonance Theory covers all cases of illumination, from the narrow cone which gives pronounced interference effects with little in the nature of a true image, to full equivalence illumination with which interference effects are entirely invisible. It is difficult to conceive that anything of importance can be added to this Consonance-Dissonance Theory, unless our ideas of the behavior of light should come to be drastically revised. Since, however, we must assume that light will continue to behave in the same way even if our ideas of its nature should change, the likelihood of any successful challenge being offered to the Consonance-Dissonance Theory . . . would appear to be remote."

Fluorescence microscopy applied to entomology and allied fields, R. L. Metcalf and R. L. Patton. (Cornell Univ.). (*Stain Technol., 19 (1944), No. 1, pp. 11–27, illus. 2*).—The authors find that by use of ultraviolet illumination and the proper fluorescent dyes, when needed, many details of structure and physiological differentiation are made apparent which by illumination with visible light are obscure.

A small, high-pressure mercury-vapor lamp was found to yield enough radiation in the range of ultraviolet wavelengths at which glass is reasonably transparent (350–400 mμ) and by which, mainly, fluorescence of biological material is excited, so that quartz condenser lenses, slides, covers, etc., are unnecessary. Glass light filters, transparent to the required ultraviolet band, but nearly opaque to visible light, are also reported upon. A slightly acidified copper sulfate solution (concentration 5–10 percent, thickness 1 cc.) served to absorb the small proportion of red light which passed the Corning red ultra filter No. 584. An aluminized front surface

mirror was found desirable, but not essential. The usual mounting media show fluorescence, but isobutyl methacrylate provided the necessary medium for permanent mounts, and petrolatum was used for temporary mounts. Dyes of the acridine, xanthene, thiazole, quinoneimine, phenylmethane, and azo series are listed with the colors emitted by them under ultraviolet excitation and the type of material for which they were found especially suitable. To this list is added the alkaloid berberine of which the sulfate was used. This showed a yellow fluorescence. Its use for protozoan parasites (malaria) is suggested. Very dilute solutions and very brief periods of staining (from 1 : 1,000 to 1 : 10,000 dilutions applied for 0.5–5 min.) were found sufficient.

Microscopy with plastic substitutes for cover glasses, O. W. Richards, J. H. Small and P. W. Collyer (*Stain Technol., 19 (1944), No. 2, pp. 59–62*).—To determine whether plastic substitutes for cover glasses on microscope slides affect the performance of the microscope, their optical constants were determined. The plastic covers and glass covers were also mounted on silvered slides to form star test plates which were studied by competent observers. The thicker plastic covers, now on the market, are satisfactory when mounted to give a plane surface. Optically inhomogeneous materials, of irregular thickness, those that curl or do not have plane surfaces, adversely affect the performance of the microscope and should not be used. Since the substitutes are softer than glass, they must be protected from abrasion.

It is recommended that thicknesses of 0.18 mm. and none outside of a range of from 0.12 to 0.20 mm. be used. For critical observation with unimmersed objectives of high aperture, best results are obtained with the correction collar set at the position corresponding to the actual thickness of the cover slip, just as would be done with glass covers.

Synthetic mounting medium of high refractive index, W. D. Fleming (*Jour. Roy. Micros. Soc., 63 (1943), No. 1–2, pp. 34–37*).—The author prepared a synthetic resin of a refractive index of about 1.7–1.8 by condensing formaldehyde with naphthalene and polymerizing the product. For this purpose, 200 cc. of formaldehyde solution (formalin, 37–41 percent formaldehyde) are poured over 200 gm. of naphthalene. A motor-driven stirrer is desirable, but not necessary, for small batches. The mixture must be chilled in cracked ice. To the chilled mixture there is added very slowly and with constant agitation a well-chilled mixture of 600 cc. of glacial acetic acid and 300 cc. of concentrated sulfuric acid (sp. gr. 1.84). The temperature of the mix is held below 10° C. for the first 6 hr. by surrounding the container with cracked ice and by regulating the rate of addition of the acetic sulfuric acid. Stirring is important in this first period. After 6 hr. at a temperature below 10°, the ice pack is removed and the temperature allowed to rise to room temperature through a period of 6–12 hr., stirring being maintained at least intermittently. The temperature of the mix is then raised gradually in a water bath to 60°. This temperature is maintained with agitation until a sample of the yellow resin, removed and washed in water, is brittle at room temperature. The mass of crude resin is washed in several changes of hot water by kneading the mass with a heavy glass rod. This washing is then repeated with two changes of warm 5-percent sodium carbonate solution. The mass is chilled and ground to a fine powder in a chilled mortar, with pieces of ice in the mortar to keep it brittle. The finely powdered resin is washed by decantation with cold 5-percent sodium carbonate solution and then with ice water. The powder is dried on a filter and washed with several changes of cold 95 percent alcohol, either on the filter or by decantation. It is further washed by kneading or stirring with a heavy glass rod in several changes of boiling 95 percent alcohol and, finally, with one or two changes of boiling absolute alcohol. The mass is chilled, powdered in a dry, chilled mortar, washed with absolute alcohol,

and dried in air. The dry resin is dissolved in pure xylene, toluene, or benzene. The solution is diluted until a sample of the solution, chilled and filtered, develops no more precipitate upon standing at a low temperature. This dilution for separation of the precipitate is most important. To the thin solution, a small amount of anhydrous sodium carbonate is added. The solution is allowed to stand for at least 24 hr. in the ice box, being shaken frequently during the early part of this period. The cold solution is decanted and filtered through fine filter paper. The solvent is evaporated at a temperature not exceeding 100°. For ordinary use, this evaporation need not be continued beyond the point at which the resin is a moderately firm mass. Removal of the final traces of solvent is slow (especially if xylene is used as the solvent), and is necessary only if the refractive index of the pure resin is to be determined. Plasticizing the resin with 1 percent of butyl phthalate may be needed to prevent crazing and loss of adherence.

The author gives this product the name "Naphrax."

Paraffin section thickness: A direct method of measurement, N. P. MARENGO (*Stain Technol., 19 (1944), No. 1, pp. 1–10, illus. 14*).—The author reembedded the sections to be measured by laying them upon the surface of a trimmed block of paraffin and warming with the tip of a heated tool to the point of a surface melting after the addition of each section. Cross sections of the original sections were then cut, and the thickness of the original sections was determined by means of a filar micrometer calibrated against a stage micrometer. A Heidenhain iron-hematoxylin stain was used. It was found that bull-testis tissue cut at a microtome setting of 10μ averaged 10.82μ in thickness. Settings of 5μ and 3μ resulted in sections averaging 5.25μ and 3.31μ in thickness, respectively. To show mitochondria clearly in stages of sporogenesis in *Onoclea sensibilis* 10μ sections were useless. The mitochondria were visible in 5μ sections, but were best seen in 3μ sections.

The ripening of Ehrlich's haematoxylin, J. M. WATSON (*Jour. Roy. Micros. Soc., 63 (1943), No. 1–2, pp. 20–25*).—The most efficient of a number of oxidant ripening agents were potassium permanganate, chloramine-T, and barium peroxide. The first of these three produced a stain equal in selective and penetrative power to either the other two or the naturally ripened stain and more rapidly staining, the actual tinctorial substance being probably either the mixed potassium aluminum lake or the manganese aluminum lake. Of the three stains, this was found the most generally satisfactory. The solution ripened with chloramine-T resembled the naturally ripened stain most closely, the actual tinctorial substance probably being the slow-staining aluminum lake. The solution ripened with barium peroxide, in which the actual tinctorial substance was probably the mixed barium aluminum lake, was also a slow staining fluid. In selectivity and contrast as nuclear stains, all three fluids gave results equal if not superior to the naturally ripened stain of Ehrlich and of much greater reliability and consistency. The mechanism of ripening and overripening is discussed.

Further uses for Chlorazol black E and a new stain for botanical sections, F. D. ARMITAGE (*Jour. Roy. Micros. Soc., 63 (1943), No. 1–2, pp. 14–19, illus. 8*).—As a staining mountant for materials infected with molds, the author used phenol crystals, 2 parts by weight, lactic acid 2 parts, pure glycerine 1 part, and water 2 parts, to which he added sufficient Chlorazol black E to give the mixture the appearance of india ink. Since the dye takes some time completely to dissolve in the mixture, it is allowed to stand for a few days before it is used. Methods for the use of Chlorazol black E for staining paper-making fibers are also described.

The new stain, Chlorazol azurine G.200, was successfully used as a suspension of a lake prepared by mixing a saturated solution of dye in water with an aqueous 6-percent solution of magnesium sulfate, heating the mixture to 80° C., and stirring

well. Sections of plant material were left in the stain for 8 hr. or overnight, then washed with tap water, passed quickly through the alcohol series, and mounted. The colors observed ranged from blue in the nonlignified cell walls, through violet, to red in woody cells and orange in bark cells. After mixing with the magnesium sulfate solution, the stain loses effectiveness in two or three days.

Anilin blue as a counterstain in cytology, M. A. Darrow (*Stain Technol., 19 (1944), No. 2, pp. 65–66*).—For sections of root tips fixed in CRAF reagent, remove paraffin from the sections in the usual manner, running down through the alcohols to water. Stain 15 min. in 1 percent aqueous safranin 0 and rinse in distilled water. Apply few drops of 1.0 percent anilin blue W. S. in 95 percent alcohol for 2 min. Dehydrate in absolute alcohol, clear in xylene, and mount in balsam. This procedure gave an excellent picture of cell division and permitted microscopic study to be made within 25 min. The chromosomes and nuclei were red, the cell walls blue, and the cytoplasm nearly colorless. Root tips fixed in the specified reagent were found to show sharply stained chromosomes and blue cell walls. The results with Fleming reagent were not so good. With Karpechenko fixing reagent, good results were obtained by increasing the staining time in alcoholic anilin blue from 2 to 8 min.

Various oil soluble dyes as fat stains in the supersaturated isopropanol technic, R. D. Lillie (*Stain Techol., 19 (1944), No. 2, pp. 55–58*).—Oil red O (xylene-azo-xylene-azo-β-naphthol), oil red 4B or EGN (xylene-azo-toluene-azo-β-naphthol), and Sudan red 4B give somewhat deeper orange-red or red fat stains and more stable dilute isopropanol solutions than does Sudan IV. Sudan II gives brighter orange-yellow fat stains and stronger stable dilute isopropanol solutions than Sudan III. Brownish-red dyes satisfactory as to intensity and stability of their dilute isopropanol solutions are Sudan brown, Sudan brown 5B, and oil brown D.

The surface staining of embedded tissues, D. E. Copeland (*Stain Technol., 18 (1943), No. 4, pp. 165–174, illus. 8*).—For paraffin embedded materials: (1) Cut block, preferably on microtome, to the desired tissue surface. (2) Rinse in absolute alcohol. (3) Float face down in stain. (Ripe, concentrated alum hematoxylin, Galigher's formula being recommended, will stain in 10–15 min. Heidenhain's iron hematoxylin works exceptionally well in some cases.) Mordant in 20-percent alum 5–10 min., briefly rinse, and stain comparable 5–10 min. in 1–1.5 percent hematoxylin. (4) Allow to become blue in tap water (for hematoxylin stains). (5) Counterstain if desired. (6) Dehydrate in absolute alcohol for not more than 10 min. (7) Dry for 15–20 min. (8) Trim block to 2–3 mm. and mount between two cover glasses by use of microflame. Attach mount to slide with balsam. An adaptation of this procedure for celloidin-embedments is also described.

A modification of the Wirtz spore-staining technic, J. E. Shapiro (*Stain Technol., 19 (1944), No. 2, p. 65*).—Two or three drops of a heavy suspension of the organism are mixed with an equal volume of 5 percent aqueous malachite green solution. The mixture is heated for from 15 to 20 min. in a boiling water bath. Loop smears on clean slides are air dried, fixed by flaming, decolorized by 10 seconds' washing in running water, counterstained 1 min. in 0.5 percent safranin, washed again, and dried. Spores are stained green, vegetative cells red. For eight species of *Bacillus* the slides were clearer than those made by heating the dye on the slide.

A corrosive sublimate fixing solution for yolk-laden amphibian eggs, V. R. Gregg and W. O. Puckett (*Stain Technol., 18 (1943), No. 4, pp. 179–180*).—Fix small masses of living eggs, including the adherent jelly masses, for 48 hr. in fairly large volumes of the following: Saturated aqueous $HgCl_2$, 90 cc., formalin (full strength) 8, and glacial acetic acid 2 cc. After fixation, the eggs may be stored in 5 percent formalin for long periods. Detailed directions for washing, removal of adherent jelly and of the vitelline membrane, removal of traces of mercuric chloride,

dehydration, transfer to paraffin, infiltration, and embedding, are given. The technic described permitted sectioning at from 5μ to 15μ .

Rapid clearing of pin worms (Enterobius vermicularis) for class study, D. Minckler (*Stain Technol., 19 (1944), No. 2, pp. 63–64, illus. 1*).—Pinworms can be cleared and differentiated in one operation after formalin fixation and dioxane dehydration by using carbol xylene. The entire procedure, including fixation time, requires less than 3 days. The mounts are permanent and give sufficient detail for class study.

AGRICULTURAL METEOROLOGY

Inter-American program for training in meteorology, R. H. Weightman (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 213–214*).—A brief summary of the plans formulated to sponsor for Latin-American students a course at the observer level dealing largely with observational work and technic.

Meteorology in the Franklin Institute, [I], II, A. N. Spitz (*Jour. Franklin Inst., 237 (1944), Nos. 4, pp. 271–287, illus. 4; 5, pp. 331–357, illus. 6*).—The author here presents a well-documented (47 bibliographic footnotes) historical account of the part the Franklin Institute has played in modern weather knowledge; also included is a brief summary of the contributions of Benjamin Franklin himself, as well as of his great-grandson, to the science of meteorology prior to the birth of the institute which in 1824 was organized in his honor.

Abstracts and discussions of papers, N. Y. meeting (*Amer. Met. Soc. Bul., 25 (1944), No. 3, pp. 99–103*).—The following are included: Transport Theory of Ozone Variation, by F. W. Decker, C. P. Mook, and J. R. Smith (p. 99); On the Significance of Correlations of Large-Scale Circulations and Computation of the Correlation Coefficients, by I. I. Schell (p. 99); Pressure Changes Due to Vertical Motion, by H. A. A. Panofsky (pp. 99–100); Causes of Nighttime Thunderstorms Over the Middle West, by D. M. Crowley (p. 100); Contribution to Nocturnal Instability by Advection, by L. L. Means (pp. 100–101); Methods of Estimating or Determining the Heights and Motions of Clouds, by C. F. Brooks (pp. 101–102); The Vertical Structure of the Atmosphere as Shown by Correlation Studies, by G. W. Brier (p. 102); and A Method of Preparing Prognostic 24-Hour 10,000-Ft. Charts, by J. E. Walsh (p. 103).

Verification of short-range weather forecasts (A survey of the literature), I–III, R. H. Muller (*Amer. Met. Soc. Bul., 25 (1944), Nos. 1, pp. 18–27; Span. abs., p. 27; 2, pp. 47–53; 3, pp. 88–95*).—In a survey of literature on short-range forecasting 69 items were found to contain discussions of verification, but only 55 appeared sufficiently important to warrant summarization. These ranged in length from less than 1 to nearly 100 pages; 22 were in English, 26 in German, 3 in French, 2 in Dutch, 1 in Russian, and 1 in Danish. The date of the earliest article was 1884, the most recent one 1943; half of them were published before 1913, the others after 1920.

The introductory part of the present paper provides a bird's-eye view of the subject and should serve as a guide to the more detailed summaries, which appear chronologically arranged in sections 2 and 3. "However, the summaries will merely serve to indicate whether or not a given article is relevant to the problem under investigation; they are not to be taken as complete abstracts of the contents."

Ultra-violet and daylight rays in relation to the seasons and the solar cycle, J. R. Ashworth (*Roy. Met. Soc. [London], Quart. Jour., 69 (1943), No. 302, pp. 275–285, illus. 4*).—Accounts are presented of apparatus used in measuring light radiation, together with results of 11 years' observations of the intensity of ultraviolet and daylight rays and their ratio. It is shown that the variation of the

ratio of ultraviolet to daylight rays closely agrees with the variation of the sunspot number in the solar cycle. Observations of annual and daily inequalities of this ratio are also given and compared with the researches of E. Petit at Mount Wilson Observatory. The paper concludes with a discussion.

A photographic recorder for the determination of wind-velocity gradients, L. B. CORWIN. (U. S. D. A.). (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 142–144, illus. 1*).—The photographic recorder appears to offer a means of obtaining an autographic record of many if not most meteorologic and climatic values. The equipment described must be modified in certain respects before it can be used as readily as a box camera; this objective is being approached experimentally.

A stability-term in the wind-gradient equation, M. HALSTEAD (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 204–208, illus. 3*).

Some aspects of stability deduced from vertical wind shear, F. L. MARTIN (*Amer. Met. Soc. Bul., 25 (1944), No. 3, pp. 79–87, illus. 3*).—A convenient construction of the stability field is set up and illustrated from consideration of the vertical wind shear. By means of an equation and tabular data, the actual spacing of the isolines of the mean lapse rate between shear levels may be easily determined. Finally, two simple technics are established for determining expected changes in the mean lapse rate at a terminal for 6–12-hr. periods. The changes in stability here considered are those due only to advection, such factors as convergence, radiation, evaporation, and condensation having been neglected. In view of approximations made in expressing derivatives in terms of definite differences, the specific results are applicable only for short-term forecasts of the order of 12 hr. These results, however, should prove of considerable value in forecasting the afternoon convective activity from the morning pibal.

Variations in wind velocity near the ground, N. CARRUTHERS (*Roy. Met. Soc. [London], Quart. Jour., 69 (1943), No. 302, pp. 289–301, illus. 4*).—For various purposes, estimates of both mean velocity and gustiness at other than the standard exposure and height of 10 m. (33 ft.) are often required. A summary is here given of relevant literature (28 references), the discussion dealing first with variations in mean velocity on increase in height above the ground and then with gustiness and its relation to changes in mean velocity and height. Next, seasonal and diurnal variations in gustiness are considered and the effect of changes in direction of the mean wind. A general approximate law for variation of wind velocity with height is suggested, and tables are presented for estimating velocities at other than the height of observation. The paper concludes with a paragraph on the range of wind velocity. The wind velocities here considered are those in the lowest layers of the atmosphere, extending from the ground to about 500 m.

Precipitation regions in the United States, S. S. VISHER (*Roy. Met. Soc. [London], Quart. Jour., 69 (1943), No. 302, pp. 265–273, illus. 9*).—"The present article is partly an abstract of a long one" by the author, previously noted (E. S. R., 88, p. 445).

Research on the influence of climate on deciduous fruit growing, G. D. B. DE VILLIERS (*Chron. Bot., 7 (1943), No. 8, pp. 388–390*).—Since 1936, extensive investigations of the influence of climate on growth and production of fruit trees have been conducted in South Africa; the salient inferences drawn therefrom are here briefly summarized. This work has been expedited by the erection in 1940 of a modern fully equipped meteorological observatory on the experimental farm at Stellenbosch and of substations in 12 of the major fruit-growing centers.

Phenology in forestry, M. A. HUBERMAN. (U. S. D. A.). (*Chron. Bot., 7 (1943), No. 8, pp. 403–404*).—A brief statement of the content of the science of phenology, a critique of some of the methods often used in studying the relationship

of local climate to periodicity of annual phenomena in living things, and a discussion of sound principles and procedures and their potential scientific and practical significance.

SOILS—FERTILIZERS

Thomas Jefferson, soil conservationist, H. H. Bennett (*U. S. Dept. Agr., Misc. Pub. 548 (1944), pp. 16*).—This publication is designed to record Jefferson's activities as a "pioneer American soil conservationist." The condition of his lands today is also described.

According to modern criteria, Jefferson's agriculture "would be found wanting primarily in terms of degree rather than kind. In his writings he mentioned many of the practices—though some he called by a different name—that a modern soil conservationist considers in making a farm conservation plan: Use of cover crops, of fertilizers, and of crop rotations that include grasses and legumes; interplanting a closer growing crop with a row crop; contouring; deep plowing where needed; gall and gully control; increased livestock production; and controlled woodland cutting. He was aware of the importance of adjusting land use to land capability."

Soils of Meagher County [and Broadwater County]: Soil reconnaissance of Montana—Preliminary report, L. F. Gieseker. (Coop. U. S. D. A.). (*Montana Sta. Bul. 420 (1944), pp. 63, illus. 5; 421, pp. 58, illus. 5*).—These two counties lie, respectively, in one of the mountainous sections of the State and an intermountain basin and cover 2,369 and 1,216 sq. miles. Physiographic and climatic conditions and other factors related to local agricultural possibilities are briefly noted with the findings of the State reconnaissance survey (E. S. R., 89, p. 290).

Heavy loss from erosion during March, R. Woodburn. (Coop. U. S. D. A.). (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 4, p. 1*).—Rainfall at State College for March was 9.25 in., of which 8.66 in. caused runoff from a bare plat on a slope of 9 percent. A table shows very heavy soil loss and percentage of rainfall running off (maximum 97.2 percent) during the major rains of the month.

A 20-ft. strip of unspaded heavy vetch reduced the runoff and erosion to levels very low as compared to those of an unspaded strip of sparse weeds. Although one of these plats suffered moderate erosion and moderate to heavy runoff, the losses did not approach those suffered by the bare plat on similar slope.

Soil treatment to improve permanent pastures, A. W. Klemme (*Missouri Sta. Cir. 289 (1944), pp. 7, illus. 2*).—The livestock-carrying capacity of many Missouri pastures is exceedingly low because of their depleted soil fertility, overgrazing, and infestation with unpalatable vegetation of low nutritive value. Some of the land used for permanent pasture is now so low in fertility and so badly eroded that it should be reforested and used exclusively to grow timber. Only those areas best suited to pasture should continue to be used for that purpose. Lime, nitrogen, phosphorus, and frequently potash, are needed. Top dressings of manure on thin, eroded areas will help to reestablish grass and legumes on these spots, materially to increase their carrying capacity, and to check erosion.

A study of the relation between some of the physico-chemical properties of New York soils and their response to fertilization ([*New York*] *Cornell Sta. Rpt. 1943, pp. 89–90*).—This study showed many of the "quick soil tests" to be subject to serious analytical errors and, therefore, unreliable. Interferences by adverse ions were found to cause sufficiently serious errors to invalidate the results in many instances. These interferences have been obviated by development of more specific reagents, and by use of competitive or differential complex-ion formers. Accurate and chemically reliable quick soil tests suitable for practical routine soil testing have been developed for the following constituents: Calcium; magnesium;

potassium; manganese; iron; aluminum; phosphorus; nitrate nitrogen; and ammonia nitrogen.

A single soil extract is prepared by extracting 1 part of soil with 5 parts of sodium acetate solution buffered at pH 4.8 as in Morgan's Universal extracting solution (E. S. R., 77, p. 302). A total volume of 15 cc. of the soil extract is sufficient for all of the tests. The removal of soluble organic matter, which would otherwise cause interferences in some of the tests, is effected by activated carbon during the extraction process. The individual tests are made directly on separate aliquots of the filtered soil extract without preliminary separation or treatment. The quantities of the various constituents are determined by comparison with a series of standard solutions carried through the tests simultaneously with the soil extracts.

Investigation of pot culture methods for detecting the mineral nutrient level of soils with particular reference to potassium ([*New York*] *Cornell Sta. Rpt. 1943, p. 94*).—When three sunflower plants were grown in each 100-gm. portion of soil diluted with 354 gm. of pure quartz sand and were provided with all essential nutrients other than potassium, the dry weight of the sunflower plants at the end of a 35-day period proved to be a reliable indication of the available potassium supply in the soil.

A laboratory method for the artificial alteration of aluminosilicates, N. S. Hall (*North Carolina Sta. Tech. Bul. 77 (1943), pp. 32, illus. 5*).—A laboratory method for studying soil weathering and soil development consists of including between two electrodes a suitable mineral-filler mixture, applying a low-frequency alternating potential through a split-ring commutator, and providing a suitable arrangement for the application and collection of a leaching solution. A wide variety of weathering conditions can be imposed upon a mineral so treated.

The experimental work appeared to substantiate the principle of clay eluviation in the formation of B-horizons as well as the formation of clay in place. It is also held probable that clay migrates to the lower horizons in soil, the first step being the development of a small portion of clay throughout the solum. The unsaturated clay activates the more saturated and causes it to migrate. As the clay passes over or into a vertical and open channel, the force of gravity will be greater than that of the attracting particle until the particle is no longer mobilized or the pores are too small. When the clay reaches the region in which it is demobilized, it will migrate further by reason of the washing action of the soil water. The migration will be slow and an accumulation of clay will result. With the increase of clay in a subsurface layer, the reaction rate will be increased and more clay will be formed in place. With regard to clay formation, it was indicated that clay formation takes place as a result of internal rearrangement of the aluminosilicate crystal. The author holds that the nonmicaceous aluminosilicates will lose bases from the larger silt-sized particles. These particles will split at the cleavage planes until the resulting crystal becomes of minimum size. At this point, further loss of base will result in a weakening of the crystal structure. When the structure has weakened to a definite point, the crystal will collapse and a new mineral (secondary clay mineral) will be formed. Micaceous minerals will also split along cleavage planes to a minimum size. Subsequent loss of cations will then come from the K^+ ions that bind the 001 faces. As these K^+ ions are lost, the forces holding these faces together will be weakened to the point where they no longer hold, and they will expand about 5 a. u. with the formation of montmorillonitic minerals.

The role of the soil water appears to depend upon the length of time that it is in contact with the soil material particles. Within a given rainfall regime, the rate of infiltration is believed relatively more important than the total amount of water passing through the soil.

Fertilizers: What they are and how to use them, C. E. Millar and L. M. Turk (*Michigan Sta. Spec. Bul. 133, rev. (1944), pp. 44, illus. 21*).—This is a revision of a former practical fertilizer-application manual (E. S. R., 51, p. 815), the recommended practices being specifically adapted to Michigan conditions with respect to soils, crops, and incidence of deficiency diseases.

Fertilizer recommendations for North Carolina, 1943–44 (*North Carolina Sta. Agron. Inform. Cir. 133 (1943), pp. 8+*).—The fertilizer mixtures of which sale is permitted under war restrictions are listed, and recommendations are given by crop and by soil region.

Commercial fertilizers, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 505 (1943), pp. 16*).—The average nitrogen content of fertilizer mixtures was found to have dropped, because of munition requirements for this element, from 5.30 percent in the 1942 products to 3.89 percent in 1943; but there was no evidence of the use of organic nitrogen carriers of inferior quality.

This report covers analyses of animal manures and limes as well as those of commercial fertilizers.

AGRICULTURAL BOTANY

The role of botany in war-time, P. B. Sears (*Kans. Acad. Sci. Trans., 46 (1943), pp. 286–289*).—A general discussion.

[Botanical papers] (*So. African Jour. Sci., 40 (1943), pp. 113–122, 127–134, 147–163, illus. 36*).—The following papers presented before the 1943 meeting of the South African Association for the Advancement of Science are included: Cytological Studies in Genera of the Proteaceae, by M. P. de Vos (pp. 113–122); Yields and Chemical Composition of Pasture Herbage as Influenced by Fertilising and Frequent Clipping, by H. Weinmann (pp. 127–134); The Response of Two Varieties of Apple Cuttings to Phytohormone Treatment, by P. Munro (pp. 147–150); An Investigation Into the Chemical Nature of Frost Injury in Young Maize Plants, by L. Reinhold (pp. 151–152); Transplanting of Grasses—Some Observations, by R. J. Jordan (pp. 153–156); Data on the Sugar and Starch Content of Some Fodder Plants Under Different Physiological Conditions—Preliminary Report, by M. Henrici (pp. 157-161); and The Alkaloidal Content of Some *Datura* Species (Stinkblaar), by L. S. Dyson and J. A. Coëtzee (pp. 162-163).

Physico-chemical nature of bacteriolysis, W. A. Dorfman (*Nature [London], 153 (1944), No. 3875, pp. 169–170*).—A preliminary note.

Preparation of media (*Pure Cult. Study Bact., 12 (1944), No. 2, Leaflet 2, 9. ed., pp. 24*).—This presentation of data on technic includes sterilization and media used in pure culture study. Under the latter heading are cultivation and storage media, general differential media, media for special groups of aerobes, and media for anaerobic bacteria. There are two pages of references.

Nutrition of the enterococci, C. F. Niven, Jr., and J. M. Sherman. (Cornell Univ.). (*Jour. Bact., 47 (1944), No. 4, pp. 335–342*).—The vitamin and amino acid requirements of 19 enterococci representing the four major varieties or "species" within this *Streptococcus* group are reported upon. All required pantothenic acid, niacin, pyridoxine, and biotin; 17 strains required riboflavin, and 7 required folic acid. Of the 19 cultures, 14 grew in a medium containing 13 amino acids, the minimum combination found for one strain of *S. zymogenes*. No significant difference in nutritive requirements was found among the strains studied.

Nutrition of Streptococcus lactis, C. F. Niven, Jr. (Cornell Univ.). (*Jour. Bact., 47 (1944), No. 4, pp. 343–350*).—The nutrient requirements of a number of *S. lactis* strains were determined. All required pantothenic acid, niacin, and biotin; 18 of the 21 required thiamine; and 7 required riboflavin. All grew without added

folic acid and pyridoxine, but the latter stimulated their growth. The amino acid requirements are complex, a minimum of 14 proving necessary for prompt growth. All grew without added tryptophan, but glutamine and asparagine proved necessary for initiation of growth in all cultures tested. The closely related *S. cremoris* appeared to have similar nutritive requirements.

Butyribacterium, a new genus of gram-positive, non-sporulating anaerobic bacteria of intestinal origin, H. A. BARKER and V. HAAS. (Univ. Calif.) (*Jour. Bact., 47 (1944), No. 3, pp. 301–305, illus. 2*).—The new genus, with *B. rettgeri* n. sp., is proposed for gram-positive, nonsporulating, nonmotile, anaerobic, or microaerophilic rods that ferment carbohydrates and lactate, forming acetic and butyric acids and CO_2 as the main products.

A study of the so-called Marburg and the Lawrence and Ford strains of Bacillus subtilis, G. KNAYSI and I. C. GUNSALUS. (Cornell Univ.). (*Jour. Bact., 47 (1944), No. 4, pp. 381–389*).—The array of differences found between so-called Marburg (C_4) and so-called Lawrence and Ford strains (S_8) of *B. subtilis* and here discussed is believed sufficient to place the two organisms as distinct species. "If C_4 is to be called *B. subtilis*, then S_8 should carry a different name."

The nutritional requirements of Clostridium acidi-urici, H. A. BARKER and W. H. PETERSON. (Univs. Calif. and Wis.). (*Jour. Bact., 47 (1944), No. 3, pp. 307–308*).—Note.

On the rôle of carbon dioxide in the metabolism of Clostridium thermoaceticum, H. A. BARKER. (Univ. Calif.). (*Natl. Acad. Sci. Proc., 30 (1944), No. 4, pp. 88–90*).—The experimental results presented are believed consistent with the view that CO_2 is converted into acetic acid, though proof of this mechanism must await application of one of the two direct methods here mentioned.

The bactericidal properties of antibiotic agents, H. C. REILLY and S. A. WAKSMAN. (N. J. Expt. Stas.). (*Jour. Bact., 47 (1944), No. 4, p. 407*).—An abstract.

A rapid and accurate method for testing penicillin production by different strains of P. notatum, S. A. WAKSMAN and H. C. REILLY. (N. J. Expt. Stas.). (*Jour. Bact., 47 (1944), No. 3, pp. 308–309*).—Note on *Penicillium notatum*.

A simplified technique for the agar cup assay of penicillin, L. S. CHOLDEN (*Jour. Bact., 47 (1944), No. 4, pp. 402–403*).—*Staphylococcus aureus* proved to be the most satisfactory organism for use with the simplified method described, which is available for the ordinary bacteriological laboratory.

The nature of the antibiotic substances produced by Aspergillus fumigatus, S. A. WAKSMAN and W. B. GEIGER. (N. J. Expt. Stas.). (*Jour. Bact., 47 (1944), No. 4, pp. 391–397, illus. 1*).—*A. fumigatus* produces several antibiotic substances differing in chemical nature and range of antibacterial action. Of the three such substances formed, viz, fumigatin (the chemically related spinulosin is produced by only a few strains), fumigacin, and gliotoxin, the first is the least active, the second more so, and the last is most active. Gliotoxin also acts on a greater number of bacteria (including various gram-negative forms) and is more toxic to animals than fumigacin. A compound recently described by British investigators as helvolic acid appears to be the same as fumigacin. Of the three compounds produced, fumigacin —because of its lower toxicity to animals and its in vivo activity—offers the greatest chemotherapeutic promise; it is far less active, however, than penicillin.

An antibacterial substance from Aspergillus clavatus and Penicillium claviforme and its probable identity with patulin, F. BERGEL, A. L. MORRISON, A. R. MOSS, R. KLEIN, H. RINDERKNECHT, and J. L. WARD (*Nature [London], 152 (1943), No. 3869, p. 750*).

A dictionary of the fungi, G. C. AINSWORTH and G. R. BISBY (*Kew, Eng.: Imp. Mycol. Inst., 1943, pp. 359+, illus. 138*).—"In this work an attempt has been

made . . . to give a list of all the generic names of fungi (Eumycetes and Myxothallophyta but not bacteria and lichens) that have been in use to the end of 1939. For every genus a systematic position is given, together with the distribution and number of its species. There are, in addition, short accounts of the chief families, orders, and classes of fungi and of the bacteria and lichens; explanations of words used in mycology; the common and scientific names of important fungi; and other details of interest to systematic and to applied mycologists and to plant pathologists. About half the 7,000 generic names are listed as synonyms." The text is mostly in basic English, except for the appendix. The latter presents G. W. Martin's key to the families of fungi.

A bibliographical study of the Icones Pictae Specierum Rariorum Fungorum of Christiaan Hendrik Persoon, H. M. Fitzpatrick. (Cornell Univ.). (*Mycologia, 36 (1944), No. 2, pp. 177–187, illus. 4*).—"Adoption of the Synopsis Methodica Fungorum, by the International Botanical Congress, as the starting point for nomenclature of the Ustilaginales, Uredinales, and Gasteromycetes has caused that book to be more widely used in recent years than any other of Persoon's publications. The companion volume of hand-colored plates prepared by him to illustrate some of the less common species described in the Synopsis is, in comparison, little known." This book is the subject of the study here presented.

Autolysis and sporulation in the yeast colony, C. C. Lindegren and E. Hamilton (*Bot. Gaz., 105 (1944), No. 3, pp. 316–321, illus. 5*).—Yeast colonies were found to contain an outer layer of autolyzed cells; this layer is the region in which sporulation occurs. Autolysis of yeast cells is believed to provide a substrate favorable to production of spores. Other investigators have shown that in bacterial colonies a similar structural differentiation exists.

Tentative keys to the Boletaceae of the Kaniksu National Forest, A. W. Slipp and W. H. Snell. (Univ. Idaho et al.). (*Northwest Sci., 18 (1944), No. 1, pp. 17–24*).

Taxonomic-ecologic studies of the Boletaceae in northern Idaho and adjacent Washington, A. W. Slip and W. H. Snell. (Univ. Idaho et al.). (*Lloydia, 7 (1944), No. 1, pp. 1–66, illus. 41*).—This paper is the first product of an investigation by the senior author on the ecological relationships of the forest fungi of the region; it is anticipated that other Boletaceae will be found, but the 23 species (including new taxonomy) here discussed are believed to represent the majority occurring in the area, since in the preceding two seasons no additional species have been observed. The topics considered in this monographic study include zonation and succession, boletes in relation to the forest associations, mycorhizas, effect of association and environment on intraspecific variation, occurrence in relation to disturbance of the substrata, description and handling of collections, and species descriptions—with keys to the subfamilies, tribes, and genera and a "tentative key to Boletaceae of the Thuja-Tsuga zone on the Kaniksu National Forest." For reprint of these keys, see above. Keys to the five genera represented in the collections are distributed through the text. The fungi collected during this study—begun in 1939—are almost certainly components of mycorhizas produced on the tree species, indicating the regional importance of the investigation. There are 55 references.

Problems in the classification of cultivated plants, E. Åberg. (Univ. Wis.). (*Chron. Bot., 7 (1943), No. 8, pp. 375–378*).—The discussion deals historically with the problems of classification of cultivated plants and their varieties and strains, with special reference to methods for adequately describing the products of plant breeding, as illustrated particularly by the small grains.

Multiple measures for distinguishing closely related plant forms, H. Hopp. (U. S. D. A.). (*Chron. Bot., 7 (1943), No. 8, pp. 402–403*).—The development of quantitative expressions for plant characters is a problem frequently offering

considerable difficulty to the taxonomist. It is concluded from the discussion, however, that the fundamental considerations on which the identification of plant forms by compound numerical expressions is based—i. e., defining characters by objective measurement rather than by subjective verbal descriptions and diagnosing plant forms by several characters rather than by relying on a single character—are so well recognized that the technic merits more extensive trial.

The taxonomy and cytology of the subgenus Gormania of Sedum, R. T. CLAUSEN and C. H. UHL. (Cornell Univ.). (*Madroño, 7 (1944), No. 6, pp. 161–180, illus. 3*).—The subgenus studied included six species which together constitute a natural phylogenetic group restricted to the Pacific Mountain System of western North America.

Species Batorum: The genus Rubus in North America, VI–VIII, L. H. BAILEY (*Gentes Herbarum, 5 (1943), No. 6, pp. 425–461+, illus. 19; 5 (1944), Nos. 7, pp. 465–503+, illus. 18; 8, pp. 507–588, illus. 42*).—No. 6 of this monographic taxonomic work on the genus *Rubus* (E. S. R., 89, p. 34) comprises the section Cuneifolii (ashen blackberries, sand blackberries); No. 7, the section Canadenses (the smooth and the thornless blackberries); and No. 8, the section Alleghenienses (copsy highbush blackberries).

An analysis of the flora of the Bull Run Mountain region of Virginia using Raunkiaer's "life-form" method, H. A. ALLARD. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 4, pp. 112–119, illus. 1*).

Pollen analysis of some buried soils, Spartanburg County, South Carolina, S. A. CAIN. (Univ. Tenn.). (*Bul. Torrey Bot. Club, 71 (1944), No. 1, pp. 11–22*).—In this area there are numerous small sedimentary basins containing highly organic soils buried under several feet of inorganic soil of types generally considered residual. Pollen analyses of four of these buried soils indicated their age sufficiently to relate them to a cooler climate than now prevails, and thus their burial was probably not associated with accelerated erosion in historical times due to agriculture. The profiles revealed some indication of repeated destruction of the oak-hickory-chestnut climax by fire, its replacement by pine, and its recovery again to climax conditions. The general picture of the vegetational pattern of the area during the time of the sedimentation is considered to be as follows: The rolling uplands were covered by a climax of oak-hickory-chestnut; ravines and protected slopes contained stands of mixed mesophytes; in several places where small streams were impounded, post-climax spruce-fir grew on and around boglike basins; over the upland the prevailing climax was interrupted by stands of pine and pine-hardwood mixtures representing various stages of secondary succession.

Method of testing legume bacteria cultures and results of tests of commercial inoculants in 1943, L. T. LEONARD (*U. S. Dept. Agr. Cir. 703 (1944), pp. 8*).—The methods used in preparing inoculant samples, seed, and planting media for greenhouse testing are described, and the findings from tests made in 1943 are summarized. At present 11 concerns are engaged in producing cultures of nodule bacteria; these are listed along with the trade names of the cultures and the types of carriers used therein.

Vitamin content of ingredients of microbiological culture media, J. L. STOKES, M. GUNNESS, and J. W. FOSTER (*Jour. Bact., 47 (1944), No. 3, pp. 293–299*).—The common dehydrated ingredients, such as peptones, yeast extract, meat extract, etc., were assayed for their contents in thiamine, riboflavin, pantothenic acid, niacin, biotin, pyridoxine, folic acid, and *p*-aminobenzoic acid; their vitamin values were then compared with the published amounts considered essential for optimum growth of various bacteria and fungi, including yeasts. When the peptones, meat extracts, etc., are used singly or in some combinations at 1–2 percent concentration, the resultant media may be deficient in thiamine, riboflavin, pantothenic acid, pyridoxine,

and *p*-aminobenzoic acid but not in niacin, biotin, or folic acid. It is suggested that such growth factor deficiencies in media may be remedied by proper combinations of the different ingredients or by addition of liver or yeast concentrates or synthetic vitamins.

Vitamin requirements of Torula cremoris, S. A. Koser and M. H. Wright (*Soc. Expt. Biol. and Med. Proc., 53 (1943), No. 2, pp. 249–251*).—Nicotinamide, biotin, calcium pantothenate, and thiamine must be supplied for prompt and abundant growth of *T. cremoris* in a basal medium of inorganic salts, glucose, and ammonium phosphate or amino acids. The combination of nicotinamide and biotin supports slow growth and under certain conditions the former alone may suffice. Tests with four vitamins singly and in combinations showed that the response depends to some extent on the basal medium used. The results emphasize the importance of composition of basal medium in studies of vitamin requirements.

Effects of yeast extracts and phenylmercuric nitrate on yeast respiration and growth, E. S. Cook and C. W. Kreke (*Soc. Expt. Biol. and Med. Proc., 53 (1943), No. 2, pp. 222–225, illus. 1*).—Phenylmercuric nitrate 1-100,000 proved toxic to bakers' yeast suspensions as shown by respiration measurements, methylene blue staining, and plating; 1 percent of an aqueous-alcoholic yeast extract protected it to some extent from this germicidal action. Respiration may cease after introduction of yeast extract plus this nitrate, but the yeast remains viable as shown by plating and methylene blue staining tests. The importance of respiratory depression in the mechanism of this toxicity reaction is supported, but caution must be exercised in use of respiratory depression as a sole criterion of toxicity to yeast. The yeast extract overcomes the growth-depressant effects of phenylmercuric nitrate on yeast.

Temperature, thiamine, and growth of Phycomyces, W. J. Robbins and F. Kavanagh (*Bul. Torrey Bot. Club, 71 (1944), No. 1, pp. 1–10, illus. 3*).—When *P. blakesleeanus* was grown at 10°, 15°, 20°, and 25° C. in a basal solution containing limited amounts of thiamine, the maximum dry weights increased as the incubation temperature decreased. The efficiency with which the thiamine was used in producing dry matter was greater at the lower than at the higher temperatures, and the benefit of excess thiazole was greater at 25° than at 10°. The relation of these results to the use of *Phycomyces* in bio-assays and to concepts of the metabolism of thiamine is discussed.

Extent of auxin-precursor hydrolysis in different Avena assay methods, G. S. Avery, Jr., J. Berger, and B. Shalucha (*Bot. Gaz., 105 (1944), No. 3, pp. 364–369, illus. 1*).—Published reports have been made that deseeded oats test plants respond to auxin precursor in 2–6 hr. The evidence here presented, based on studies of crude and purified preparations of a maize auxin precursor, indicates that curvatures obtained during the 5-hr. test period represented free auxin and not that converted from a precursor. Whether under any conditions deseeded test plants ever convert precursor into auxin, even if employed for long test periods, is questioned.

Ascorbic acid and hip fertility in Rosa species, Å Gustafsson and J. Schröderheim (*Nature [London], 153 (1944), No. 3876, pp. 196–197*).—Evidence is presented of a negative correlation of hip fertility with its content of ascorbic acid.

Osmosis and osmotic pressure, A. S. Crafts. (Univ. Calif.). (*Chron. Bot., 7 (1943), No. 8, pp. 386–388*).—A discussion of the current disagreement on terminology and the confusion regarding the mechanics of the processes involved in osmosis and osmotic pressure.

Effects of high salt concentrations on growth of bean plants, H. G. Gauch and C. H. Wadleigh. (U. S. D. A.). (*Bot. Gaz., 105 (1944), No. 3, pp. 379–387, illus. 4*).—Red kidney beans were grown to the flowering stage in aerated solution culture with basal nutrients to which were added various amounts of five individual

salts. The effects of these separate salts on growth were studied in concentrations of 1.5, 2.5, 3.5, and 4.5 atmospheres osmotic concentration, including the 0.5 atmosphere of the basal nutrient. At isosmotic concentrations very similar amounts of plant growth occurred in the NaCl, $CaCl_2$, and Na_2SO_4 series, but there was marked depression with $MgCl_2$ and $MgSO_4$. For most salts and mixtures of salts there tends to be a linear relationship between growth and osmotic concentration—expressed in atmospheres. The greatly depressed growth of plants in the presence of $MgCl_2$ or $MgSO_4$ as compared to that with the other three salts is attributed to the specific action of Mg, the toxicity symptoms of which are described.

Anatomical responses of tomato stems to variations in the macronutrient anion supply, C. B. Lyon and C. R. Garcia. (U. S. D. A. and Univ. P. R.). (*Bot. Gaz., 105 (1944), No. 3, pp. 394–405, illus. 6*).—When plants of an inbred strain of Bonny Best tomato were grown in sand culture in the presence of 44 different nutrient solutions, great differences in stem diameter and actual area of each of the component tissues could be correlated with variations in the nutrient supply. Differences in the relative proportions of phloem, xylem, and pith in stem sections were correlated with variations in nutrient supply, but no differences were found in the relative amount of cortex. Cellular differences in pith parenchyma, xylem vessels and fibers, internal and external phloem, internal and external pericyclic fibers, and cortical cells are described and correlated with nutrient supply. Differences in the anatomy of the tomato stems were significantly correlated with characteristics used as criteria of vegetative growth and fruitfulness.

The causes and control of flowering, J. Grainger (*Chron. Bot., 7 (1943), No. 8, pp. 400–402*).—This brief review considers the floral organization in time and space, the relations of temperature and metabolism to flowering, and food consumption after flowering. The emphasis rests on the need for an adequate supply of carbohydrate to the growing point before it can change from vegetative to floral activity, though other qualitative necessities must also be available.

Collection of pollen and artificial wind pollination, D. Lewis and L. F. La Cour (*Nature [London], 153 (1944), No. 3875, pp. 167–168, illus. 1*).—The device described for collecting pollen is based on air suction; with the air current reversed it can be used as a pollinator. It is also suggested that the apparatus can be applied to measure accurately and quickly the pollen production of plants, about which there is at present but little knowledge.

Relative growth of flower parts of two species of Iris, H. P. Riley. (Univ. Ky.). (*Bul. Torrey Bot. Club, 71 (1944), No. 2, pp. 122–133, illus. 8*).—Detailed results are presented of a study of the relative growth rates of flower parts of *I. fulva* and *I. hexagona giganticaerulea.*

The synthesis of lignin-like complexes by fungi, L. A. Pinck and F. E. Allison. (U. S. D. A.). (*Soil Sci., 57 (1944), No. 2, pp. 155–161*).—Synthesis of ligninlike complexes by 12 cultures of filamentous fungi grown on a mineral-sucrose medium was studied, the mycelium of *Cladosporium* containing as high as 24 percent of them. The average values for the genera studied were *Cladosporium* 21.1, *Helminthosporium* 19, *Humicola* 8.1, *Dematium* 7.1, *Alternaria* 6.8, *Aspergillus* 6.4, *Metarrhizium* 3.6, and *Gliocladium* 2.4 percent; these represent the nonnitrogenous-portion of the fungus substance resisting digestion with 72 percent H_2SO_4. In general, the black or brown fungi were comparatively high in lignin complexes, whereas the colorless or light-colored organisms contained lower percentages. The failure of previous workers, using various genera, to agree as to the ability of fungi to form substances resistant to decay is believed largely explained by these results. Under best growth conditions (pH 7 or slightly above and adequate trace elements), approximately 40–50 percent of the C of sucrose was converted into cell material by *Cladosporium, Helminthosporium,* and *Gliocladium*; the corresponding values for

the other organisms were 25–30 percent. The C:N ratios of the fungus material varied from 10.7 to 22.4 percent, with an average of 15.3. It is pointed out that the high-lignin organisms grow mostly on decaying vegetation at or above the soil surface. A system such as that used in stubble- or trash-mulch farming would therefore be expected to favor a high yield of humus.

The dissimilation of glucose by Chaetomium funicola Cke.—III, Some phosphorus relationships of Chaetomium funicola, G. SEMENIUK. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 18 (1944), No. 3, pp. 325–358, illus. 3*).—In further studies of this fungus (E. S. R., 86, p 727; 87, p. 491), its P relationships were investigated in cultures developed on Czapek-Dox medium. The depletion of P therein was followed through inorganic orthophosphate P and total P analysis at several intervals in the development of the fungus. Analysis was also made of the acid-soluble P constituents in the mycelium of *C. funicola* and four other fungi. An interpretation of the significance of these acid-soluble P constituents in the mycelium was sought in the light of the phenomenon of phosphorylation applied to carbohydrate dissimilation. Detailed results are given and discussed, and a critical review of the literature (117 references) is presented.

The metabolism of starving leaves.—IV, Respiration rate and metabolism of leaves of kikuyu grass during air-nitrogen transfers, J. G. WOOD, F. V. MERCER, and C. PEDLOW (*Austral. Jour. Expt. Biol. and Med. Sci., 22 (1944), No. 1, pp. 37–43, illus. 5*).—In this contribution (E. S. R., 89, p. 297) the metabolism of leaves of *Pennisetum clandestinum* was investigated on transfer from N to air and vice versa at various stages of starvation, the respiration rate and amounts of hexoses, sucrose, protein, amino acids, amides, NH_3 and malic and citric acids being determined at 24-hr. intervals. During the early starvation stages, when carbohydrate substrates chiefly were being utilized, the rate of CO_2 production was about the same in N as in air; during later stages the respiration rate was many times greater in air. In N the respiration rate/time curve failed to exhibit a climacteric rise; in air this rise was associated with utilization of N compounds. In N, ascorbic acid did not decrease in amount, as in air. The rate of protein loss in N was considerably less than in air, and amino acids only accumulated but amides and NH_3 were not formed as they were in air. In N, malic and citric acids did not decrease in amount, but increased when leaves were transferred to air. Amide and organic acid metabolism in this grass is compared to that in other leaves, and the probable mechanism of the process is discussed.

Studies on the synthesis of hyoscyamine in Atropa belladonna L. and Datura stramonium L., B. T. CROMWELL (*Biochem. Jour., 37 (1943), No. 6, pp. 717–722*).—The maximum concentration of hyoscyamine in the leaves, stems, and roots was found to occur in July, the minimum in the leaves early in May and in the roots in March. Little downward movement took place from the leaves in the fall. Translocation tests led to the view that the root system is the principal seat of alkaloid synthesis; as such, the alkaloid moves from the root system to stems, leaves, fruits, and seeds. An approximate estimate of the seasonal distribution of carbohydrates was made in plants growing under normal conditions and in those deprived of light. The effects of injecting various amines was also studied. Putrescine, arginine, hexamine, and formamol stimulated alkaloid synthesis considerably; putrescine is regarded as an intermediate in hyoscyamine synthesis. Plants sprouting in darkness gave a high yield of alkaloid and volatile bases in both roots and etiolated shoots. The significance of the findings are discussed.

The role of putrescine in the synthesis of hyoscyamine, B. T. CROMWELL (*Biochem. Jour., 37 (1943), No. 6, pp. 772–776*).—An enzyme capable of oxidizing putrescine with formation of NH_3 and an aldehyde was demonstrated in the tissues of *Atropa belladonna;* it was located chiefly in the root system but also occurred in

etiolated shoots. Putrescine was also isolated in small amounts from the leaves and upper stems of *A. belladonna* and *Datura stramonium*. Its possible role in the synthesis of hyoscyamine and related alkaloids is discussed.

Respiratory rates of the shoot tips and maturing tissues in Lupinus albus and Tropaelum majus, E. Ball and E. J. Boell (*Natl. Acad. Sci. Proc., 30 (1944), No. 3, pp. 45–50, illus. 2*).—Results of the study described indicate that differences in the distribution of respiratory activity along the apical-basal axis of the shoot exist in the two plants, but that there is apparently no correlation between the developmental activities of a given region and the magnitude of its respiratory rate.

Responses of beans (Phaseolus) and other legumes to length of day, H. A. Allard and W. J. Zaumeyer (*U. S. Dept. Agr., Tech. Bul. 867 (1944), pp. 24, illus. 7*).—Of the 20 varieties of pole beans included in the *P. vulgaris* group studied, 10 were considered to be short-day and 10 to be day-neutral plants, the latter exhibiting little difference in response to the various day lengths used. Among the bush beans, 24 green-podded and 11 wax-podded varieties were studied, all showing the day-neutral behavior. Some varieties tended toward a short-day response in that there was some delay in flowering as the days were lengthened; Red Kidney illustrated this behavior. In the semipole class, 11 behaved as short-day plants and 8 as day-neutral. Among the 5 Refugee varieties considered indeterminate in growth habit, 4 proved to be short-day and 1 day-neutral in behavior. All the lima group (*P. lunatus* and its variety *macrocarpus*), including 7 bush and 4 pole varieties, were day-neutral. Of the 7 other *Phaseolus* species included in the study, 1 strain of *P. mungo* behaved as a short-day plant and a second strain as a day-neutral; 5 other species exhibited the short-day and 1 (*P. coccineus*) the long-day response. *Canavalia ensiformis, Vigna sinensis,* and *Stizolobium deeringianum* behaved as short-day plants; *Cicer arietinum* and *V. sesquipedalis* were day-neutral; and *Lupinus luteus* was a long-day plant. It was shown that day length may greatly change the growth habit of some varieties, so that a particular form such as the bush or twining behavior may closely depend on the photoperiod. It is impossible to predict in advance how a plant will react, since there may be complete reversals of behavior depending on the species. Whereas *S. deeringianum* was bushy on short days and twining on long days, *Canavalia ensiformis* was tall and vining on the short days and relatively short and bushy on the longer light periods. It was evident that the day-neutral character has been emphasized in man's improvement of beans, since it most naturally promotes earliness and, as far as the photoperiodic factor is concerned, favors the extension of such varieties into all latitudes. There are 20 references.

Dermatitis and photosensitization produced by Ptelea angustifolia, W. C. Muenscher and B. I. Brown. (Cornell Univ.). (*Madroño, 7 (1944), No. 6, pp. 184–188*).—Contact with the leaves of the yellow hoptree was found to cause a dermatitis in susceptible individuals; the severity was increased by subsequent exposure to direct sunlight. This condition proved very similar to that induced by *Dictamnus albus* and *Ruta graveolens*. In the experimentally induced dermatitis the first inflammation appeared 18–30 hr. after contact with the leaves; severe cases continued for about 10 days.

Aims in research and teaching in plant anatomy, A. S. Foster. (Univ. Calif.). (*Chron. Bot., 7 (1943), No. 8, pp. 395–397*).

La théorie du chondriome végétal [Theory of the plant chondriome], A. Gonçalves da Cunha (*Chron. Bot., 7 (1943), No. 8, pp. 397–399*).—A critical review and discussion.

A method of numerically evaluating areas of plant tissue, A. G. Whiting and J. W. Mitchell. (U. S. D. A.). (*Bot. Gaz., 105 (1944), No. 3, pp. 405–408, illus. 1*).—By the technic described, sections of a plant are cut with a

freezing microtome, stained, and mounted in glycerin jelly. An image of the section is thrown on a screen by a projection microscope; areas of tissue symmetrical in outline are then calculated from linear measurements, while irregular areas are traced on cellulose acetate, inked, and measured with an area photometer. The method is of value in accurately determining areas or volumes of specific tissues associated with specific functions, such as rubber storage in guayule.

Morphological observations on the tomato plant, F. W. Went (*Bul. Torrey Bot. Club, 71 (1944), No. 1, pp. 77–92, illus. 22*).—During the past 4 yr. the author had under observation in the greenhouse about 2,000 full-grown tomato plants and 40,000 seedlings; the more important abnormalities noted were as follows: Anomalous phyllotaxis occurred in 5–20 per cent just below the first inflorescence. The upper 3–7 leaves were supernumerary and appeared more or less whorled. Since all intermediate stages between a normal calyx primordium and a normal leaf complete with axillary bud have been found, it is concluded that these upper whorled leaves were transformed calyx primordia. Flower primordia developed into normal flowers only after the 14th–17th foliage leaf; those previously initiated remained arrested in early stages but enlarged to some extent. In this way models of flower primordia are produced which clarify a number of problems connected with flower initiation. The influence of temperature on some of these morphogenic processes is described, and various forms of fasciation, especially in flower primordia, were observed and are also described.

GENETICS

La distribucion de los pigmentos antocianicos en el arroz y su comportamiento hereditario [Distribution of the anthocyanin pigments in rice and their hereditary behavor], J. J. Burgos (*Univ. Nac. La Plata, Rev. Facult. Agron., 3. ser., 25 (1940) (pub. 1943), pp. 175–214, illus. 8; Eng., Ger. abs. p. 212*).—The macroscopic and microscopic distribution of anthocyanin pigments was studied in a collection of 125 varieties of rice. To the list of pigmented organs studied by others, the author adds data on the gross and histological distribution of anthocyanin in the organs of the germinating seed, considers its probable physiological role, classifies the varieties studied according to pigmentation with reference to a standard color chart, and presents information on the hereditary behavior of this group of pigments in rice. There are 44 references.

Amphidiploidy in Triticum-Agropyron hybrids, J. M. Armstrong and H. A. McLellan (*Sci. Agr., 24 (1944), No. 6, pp. 285–298, illus. 4*).—Sterility in *Triticum* × *A. glaucum* hybrids was overcome by inducing chromosome doubling with colchicine treatments of F_1 seed. Several methods of application are described, and their effectiveness was shown by the percentages of amphidiploids secured. Chromosome pairing and stability were improved in the third generation over that in the second. There was a significant correlation in the third generation plants between chromosome number and fertility, this relationship favoring stabilization at the higher chromosome numbers.

Phenogenetic evidence for the amphidiploid origin of New World cottons, S. G. Stephens (*Nature [London], 153 (1944), No. 3871, pp. 53–54, illus. 3*).

Die Entwicklung des Embryosacks und die Befruchtung bei Poa alpina [Development of the embryo sac and fertilization in P. alpina], A. Håkansson (*Hereditas, 29 (1943), No. 1–2, pp. 25–61, illus. 38; Eng. abs., pp. 59–60*).—The embryology of sexual and apomictic strains was studied in material from cultures of A. Müntzing. In the sexual strains the macrospore mother cell divides, forming haploid macrospores which may be arranged in many ways. Often more than one macrospore germinates, and more than one mature embryo sac is frequently observed

in the nucellus. Fertilization proceeds as usual, though some anomalies are described. Two apomictic strains were investigated: The nucleus of the macrospore mother cell divides late, the division is mitotic, and no macrospores are formed (diplospory as in *Antennaria*). The embryo sac is 8-nucleate, and the egg may divide rather early. Some irregularities may occur, such as three polar nuclei, a synergid embryo, and antipodes at the micropylar end. The embryo develops normally; when the pollen tube enters it has 8–12 cells. One of the synergids is rather disorganized at fertilization. The male nuclei are then observed between the embryo and the cytoplasm of the embryo sac. One male nucleus penetrates into the cytoplasm and fuses with the polar nuclei; the other degenerates. The endosperm is pentaploid; the embryo, diploid. The apomicts are pseudogamous; when no fertilization occurs the polar nuclei do not divide and the embryo fails to reach maturity. The egg cell may presumably be fertilized, but since it divides early and the flower opens late this seldom occurs.

Some F_1 plants from the cross sexual × apomict were investigated: The formation and behavior of the microspores are as in the sexuals. Clone 202 ($2n = 41$) threw 15 percent haploid plants. It is shown that the egg cell often divides early and that if no pollination occurs all eggs presumably divide. The moment at which the pollen tube enters the embryo sac decides whether a haploid or a diploid embryo is to be formed; the polar nuclei, however, must be fertilized. The behavior of this plant was rather like that of the apomicts. It is suggested that the growth rate of the pollen tube is an important factor in plants where the egg cell may divide whether or not it has been fertilized, as well as where the nucellus has a haploid and an aposporous embryo sac. The importance of the fertilization of the polar cell is emphasized. There are 27 references.

New hybrids from incompatible crosses in Datura through culture of excised embryos on malt media, A. F. Blakeslee and S. Satina (*Science, 99 (1944), No. 2574, pp. 331–334*).—The success in doubling chromosomal numbers with colchicine and other stimuli led to attempts to halve the numbers (in *Datura* cultures under study) by some similarly simple treatment, but without success. In order to learn more about the factors involved in embryo development, young embryos were excised and cultured on artificial media; the older ones succeeded readily but smaller embryos (under 0.5 mm.) of *D. stramonium* failed to grow. Use of coconut milk, a natural endosperm, was suggested and proved successful (E. S. R., 86, p. 602); this technic is now being used in studying speciation within the genus. Unfortunately, hybrids between certain species have not heretofore been possible; some of the blocks to crossability are enumerated and briefly discussed. It was found possible to dissect out hybrid embryos which became arrested after the proembryo stage and to cultivate them on artificial media by the method which had proved successful for normal embryos, the media containing the necessary salts, vitamins, and the "embryo factor" from coconut milk. It was later found that malt extract could replace the coconut milk factor if sterilized by filtration rather than heat; by this technic the growth of hybrid embryos from 11 new combinations in *Datura* were obtained, as well as species hybrids from combinations which had given only a single viable seed from many hundred pollinations. In addition, the dissection method has enabled the securing of numerous seedlings of certain species the seeds of which without treatment gave germination of only 0.1 percent. Furthermore, success has apparently been gained in a new hybrid *Iris* (*I. pseudacorus* × *I. versicolor*).

This dissection technic may aid in a better understanding of the factors involved in chemical regulation of embryo development, and new hybrids which it seems capable of supplying may prove useful in genetical analysis of other forms than *Datura*. In this relatively new field there is opportunity and need for many investi-

gators to explore the range within which artificial cultivation of hybrid embryos is feasible, to improve the technic and adapt it to the different forms investigated, and to study the factors which limit crossability with the aim of still further increasing the possibilities of hybridization.

Association of characters in petunia, J. WALKER (*Sci. Agr., 24 (1944), No. 6, pp. 251–258, illus. 3*).—The Flaming Velvet variety, which has broad leaves, violet flowers, and broadly pointed corolla lobes with shallow sinuses, was crossed with Hollywood Star, which has narrow leaves, rose-pink flowers, and sharply pointed corolla lobes with deep sinuses. When populations of F_1 and F_2 as well as of the F_1 backcross were examined with respect to the characters studied, the Flaming Velvet type was in every case found dominant, though only partially so for flower color. The latter appeared to be inherited on a monogenic basis and independently of both leaf type and corolla form. Leaf type and corolla form were apparently determined by closely linked or identical factors, since no cross-overs were obtained in F_2 or backcross populations. Plants with Hollywood Star leaf type and corolla form averaged a weaker constitution than the other plants; this made a factorial analysis of inheritance unreliable, but a monogenic basis for leaf type and corolla form appeared most probable.

Sporulation in Saccharomyces cerevisiae, C. C. and G. LINDEGREN (*Bot. Gaz., 105 (1944), No. 3, pp. 304–316, illus. 1*).—Sporulation in this yeast is influenced by the genetic constitution of the culture as well as by the composition of the nutrient supplied. A specific medium found to give maximum sporulation was developed and is described; on it, heterozygous, legitimately diploid cultures produced an abundance of viable 4-spored asci. Single ascospore cultures (illegitimately diploid or haploid) sporulated much more irregularly and some failed completely. The asci from single ascospore cultures usually contained only 1–2 spores, and their viability was much diminished. Among 40 commercial baking yeasts surveyed, some were legitimately diploid and others of single ascospore origin. There are 21 references.

Translocations in Sciara: Their bearing on chromosome behavior and sex determination, H. V. CROUSE (*Missouri Sta. Res. Bul. 379 (1943), pp. 75, illus. 50*).—Treatment of mature sperm with 5,000–6,500 *r*-units of X-ray yielded four translocations involving the X chromosome of *S. reynoldsi,* five involving the X chromosome of *S. coprophila,* and five involving the autosomes of *S. coprophila.* Salivary chromosomes B and X of *S. reynoldsi* were mapped and their centromere regions approximately located cytologically. Sperm formed by males heterozygous for an X translocation transmit in duplicate the chromosome with a segment of the autosome and a portion of the X chromosome. Even though three whole sex chromosomes were not present in the zygote, development of the female embryos proceeded normally and there resulted fertile female flies exhibiting a balanced chromosome complement in their salivary and oocyte nuclei.

Hereditary congenital flexed pasterns in Jersey cattle, S. W. MEAD, P. W. GREGORY, and W. M. REGAN. (Univ. Calif.). (*Jour. Hered., 34 (1943), No. 12, pp. 367–372, illus. 3*).—A fifth hereditary defect that has segregated in the University of California Jersey herd (E. S. R., 89, p. 431) is described. The abnormality involves flexion of the pasterns so severely as to cause the hoofs to turn under. The more severely affected calves walked on the knuckles of the flexed pastern joints. Although the condition may vary in young calves, it becomes less severe as the calf grows older. Mortality was no higher than in normal sibs, but some special care was given affected animals. The condition was more likely to affect the front legs, but flexing of the pastern was frequently found in the hind legs as well. The abnormality was autosomal and recessive. On matings of heterozygous sires to their own daughters and to daughters of other known heterozygous sires, there were produced 38 normal and 6 flexed-pastern animals. There

appeared to be a second type of nonhereditary flexed pasterns, phenotypically indistinguishable. One Holstein sire bred to his daughters produced 1 calf with flexed pasterns among 113 offspring, further supporting the theory of occurrence of a nonhereditary type of flexed pastern.

Inheritance of an epileptic type character in Brown Swiss cattle, F. W. Atkeson, H. L. Ibsen, and F. Eldridge. (Kans. Expt. Sta.). (*Jour. Hered., 35 (1944), No. 2, pp. 45–48, illus. 1*).—A condition involving tongue chewing, foaming at the mouth, and finally collapse, which was relieved by intravenous injections of calcium gluconate, occurred in a Brown Swiss bull purchased as a herd sire. The symptoms were quite similar to those of human epilepsy. The condition was exhibited by 4 males and 9 females of 37 calves produced by this sire. The abnormal condition was apparently dominant and could be eliminated by elimination of all animals showing the condition. The variability of the character made segregation difficult.

The influence of environmental factors on the age-correction factors for milk yield of Friesland cows in South Africa, F. N. Bonsma (*Union So. Africa Dept. Agr. and Forestry Bul. 242 (1943), pp. 18+, illus. 8*).—Differences between age-correction factors for milk production of Holstein cows were found to vary with age. The maximum milk production was obtained in Holstein cows in the Union of South Africa at 6 yr. of age, but in the United States and Netherlands about 2 yr. later. The relation of production to age varied in several provinces of the Union having different climatic, soil, temperature, and other environmental conditions. Environmental and possibly hereditary factors were responsible for differences in the course of increases and decreases in yield at different levels of production.

Zebu-cross cattle in northern Australia: An ecological experiment, R. B. Kelley (*Austral. Council Sci. and Indus. Res. Bul. 172 (1943), pp. 96, illus. 24*).—Descriptions are presented of crossbred zebu cattle, with reference to colors and quality of carcasses.

The embryology of the calf: Fetal growth weights, relative age, and certain body measurements, C. W. Nichols, Jr. (*Amer. Jour. Vet. Res. 5 (1944), No. 15, pp. 135–141, illus. 6*).—The crown-rump length, weight, sex, age, and other body measurements of 101 fetuses of Herefords are presented.

Fertility in Merino sheep in north-western Australia.—I, Observations on the incidence of oestrus in Merino ewes at Warralong Station. II, A survey of the fertility of Merino sheep in north-western Australia, A. M. Stewart and R. J. Moir (*Austral. Vet. Jour., 19 (1943), No. 6, pp. 152–164, illus. 6*).—In a study of the low reproductive rate of sheep, Merino ewes obtained in areas of Australia showed that the live weights of the ewes and their breeding reproduction reflected changes in the level of nutrition, which were in part controlled by rainfall and the condition of the ranges.

Studies in the biology of the skin and fleece of sheep.—I, The development and general histology of the follicle group in the skin of the Merino. II, The use of the tanned sheepskin in the study of follicle population density. III, Notes on the arrangement, nomenclature, and variation of skin folds and wrinkles in the Merino, H. B. Carter (*Austral. Council Sci. and Indus. Res. Bul. 164 (1943), pp. 59+, illus. 34*).—Three papers in this series are presented.

The first (pp. 7–21) is concerned with the prenatal growth and development of the single follicle of South African Merino fetuses. It is divided into 18 stages in 3 main periods, i. e., the pretrio period (stages 1–3), the trio period (stages 4–7), and the posttrio period (stages 8–18). Development of the primary and secondary follicles was initiated in the Merino during the pretrio and trio periods, but some few follicles do not seem to conform to this grouping. The fundamental cleavage of

the hair follicle population of the skin in the Merino into primary and secondary follicles does not seem to have been sufficiently appreciated by scientific workers.

The second paper (pp. 23–38), based on follicles of six tanned sheepskins, indicated that two main gradients existed. The best single estimate of density was 7–9 in. lateral to the median dorsal line and 5–7 in. posterior to the heart girth.

The third paper (pp. 39–59) reviews the economic importance in sheep husbandry of the distinctive Merino character, involving especially skin folds and wrinkles.

The effect of sex on the development of the pig.—III, Differences in growth rate between gilts and barrows by lines of breeding, R. E. Comstock, L. M. Winters, and J. N. Cummings. (Minn. Expt. Sta. and U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 120–128*).—The average daily gains from weaning to 200 lb. weight of the inbred Poland China breed in the seven lines used in the previous study (E. S. R., 87, p. 657) were 1.445 lb. per day for males and 1.406 lb. for females, and for males and females in the Minnesota No. 1 line, respectively, 1.612 and 1.523 lb. The earlier expression of sex in the Minnesota line is thought to be responsible for the sex difference, which was large enough to be considered in progeny comparisons, at least in the Minnesota line. None of the interaction involving sex in Poland Chinas was significant. The significance of the sire-sex interaction at the 5-percent level in the Minnesota No. 1 line suggests segregation. The sex difference increased with age in both groups, and the increase was significantly greater in the Minnesota pigs. The effect of selection for growth rate on age of puberty was discussed. The variance analysis was based on weight gains of 1,182 males and 1,215 females from the seven inbred lines of Poland Chinas and the one line Minnesota No. 1.

Swine project speeds improvement, L. M. Winters (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 3, pp. 10–11, illus. 6*).—One promising new line was developed and three times as much purification was made in 7 yr. by inbreeding, selection, and crossing as was accomplished in 60 yr. by the usual breeding methods. Performance (ability to make pork economically) was given priority. The six lines developed since 1937 carry about four times as much inbreeding as the average of the breed. A superior line known as Minnesota No. 1 originated from crossing the Danish Landrace with the Tamworth breed, with subsequent inbreeding. Another line was started in 1942 by crossing Poland Chinas and Yorkshires.

Are better hogs coming? J. L. Lush (*Farm Sci. Rptr. [Iowa State Col.], 5 (1944), No. 2, pp. 3–6, illus. 4*).—The crossing of inbred lines of pigs which was begun at the Iowa Experiment Station in 1930 has given promising results. Inbreeding has given equally favorable results and has been more rapid in one-sire herds than where more than one sire was used. There is a question, however, as to the relative profits from purebred and crossbred herds.

Inheritance of the white-cheek character in mice of the genus Peromyscus, W. F. Blair (*Contrib. Lab. Vert. Biol., Univ. Mich., No. 25 (1944), pp. 7, illus. 2*).—All of 63 F_1 crosses between mice of the *maniculatus* type represented by a stock of *P. maniculatus bairdii* from southwest Michigan and a strain of *leucocephalus* type that had been selected for a minimum of pigmentation had a white-cheek character. This white-cheek character (*Wc*) behaved as a single dominant to the usual colored cheek (*wc*). In 31 F_2's there were 21 with white cheeks and 10 with colored cheeks. Among 292 backcross animals produced by colored-cheek parents there were 159 with white cheeks and 133 with colored cheeks. In a linkage test white-cheeked mice (A^b *Wc/a wc*) were mated to gray-colored white-cheeked mice (*a wc/a wc*), with the result that the 4 phenotypes were produced. The 203 individuals departed enough from equality to suggest that *Wc* and A^b were either on different chromosomes or that they were very loosely linked.

Experimental modification and control of molts and changes of coat-color in weasels by controlled lighting, T. H. Bissonnette and E. E. Bailey (*Ann. N. Y. Acad. Sci., 45 (1944), No. 6, pp. 221–258+, illus. 8*).—Study of seasonal changes of coat colors of weasels showed that change-over either to white or brown may be induced at any time of the year by light effects rather than temperature. Allowance must be made for a latent period of adjustment of the internal reaction system of about 3–3.5 mo. after the effective change in the light cycle. Either gradual or sudden changes in light were effective in inducing molt and change of color. Two normal and one abnormal Bonaparte and eight New York weasels were subjected to normal and variously modified lighting. The coats are illustrated at different seasons with varying lighting effects.

Superior strains for broiler production, E. Hoffmann and A. E. Tomhave. (Del. Expt. Sta.). (*U. S. Egg and Poultry Mag., 50 (1944), No. 1, pp. 30–32*).—The superiority of one of four strains of Barred Plymouth Rocks for broiler production seems evident in weight, feather index, breast fleshing, length of keel, width of back, and livability.

The inheritance of some quantitative characteristics in turkeys, C. W. Knox and S. J. Marsden. (U. S. D. A.). (*Jour. Hered., 35 (1944), No. 3, pp. 89–96, illus. 6*).—Observations for breast type, body weight at 24 weeks of age, and shank length in 190 Standard Bronze, 179 White Holland, 161 Broad-Breasted Bronze, 1,125 Beltsville Small White, and 58 F_1 and 41 F_2 Beltsville Small White toms × Broad-Breasted Bronze hen turkeys showed that these three characters exhibited a "blending" type of inheritance. The characteristics of the F_1's and F_2's are typical for the blending inheritance of a quantitative characteristic conditioned by several undetermined genes. The breast type was rated from 1 to 9, for the best to the poorest. The three main breast grades are illustrated. There was some evidence of dominance of factors for light body weight and short shanks.

Disintegration of epididymal spermatozoa by application of ice to the scrotal testis, Min Chueh Chang (*Jour. Expt. Biol., 20 (1943), No. 1, pp. 16–22, illus. 4*).—The testes of rabbits, rats, and guinea pigs were treated with ice applied to the scrotum for 10–20 min. Disintegrated sperm were found in ejaculates 24 hr. later, the proportion of disintegrated sperm depending on the duration of treatment. Disintegrated sperm in the ejaculate lasted about 10 days, depending on the rate of evacuation of disintegrated sperm from the epididymis. The ice treatment had no adverse effect on sex drive or spermatogenesis. About 20–30 percent of disintegrated sperm was found in the epididymis of rabbits and rats, but not in guinea pigs. There were used in the study 5 rabbits, 4 rats, and 3 guinea pigs.

A satisfactory method of shipping dairy bull semen long distances, E. W. Swanson and H. A. Herman. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 2, pp. 143–146, illus. 1*).—A semen shipper, consisting of a small insulated ice cream can cooled by crushed ice and a vacuum bottle, maintained a satisfactory storage temperature from 35° to 50° F. for 84 hr. at an atmospheric temperature of 80°. With proper precautions 24 shipments of bull semen were satisfactorily made over a 12-mo. period.

Seasonal variation in semen quality of some Missouri dairy bulls, E. W. Swanson and H. A. Herman. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 303–310, illus. 1*).—"A study of the monthly variation of the initial motility, volume, concentration, useful storage time, pH, and morphology of the semen of 13 dairy bulls [of 3 breeds] used in the University of Missouri herd during 3 yr. has been presented. The monthly variations in volume, concentration, and percentage of total abnormal spermatozoa were not statistically significant. The pH of the semen was significantly lower in the summer than in the fall. Initial motility and useful viability were lower in winter than in spring and summer. The results

were interpreted as being largely due to the adverse effect of winter weather upon the physical well-being and sexual activity of the aged bulls which furnished the majority of the semen studied."

The correlation between some characteristics of dairy bull semen and conception rate, E. W. SWANSON and H. A. HERMAN. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 297–301, illus. 1*).—The correlation between conception rate and pH of the semen, abnormal sperm, and concentration of sperm used in about 500 inseminations of semen from 23 bulls was nonsignificant. A highly signifiant linear correlation of 0.84 was found between viability of the sperm in storage and conception. A significant curvilinear relationship was found between motility and conception. Conception increased as motility increased up to rating 3, and thereafter increased motility did not result in important increases in conception.

Studies of semen and semen production, R. E. COMSTOCK, W. W. GREEN, L. M. WINTERS, and A. W. NORDSKOG (*Minnesota Sta. Tech. Bul. 162 (1943), pp. 55, illus. 4*).—Sperm cell density in semen was rapidly and accurately estimated by determining the light transmission with a photoelectric colorimeter. In 24 samples, the relation between sperm cell count and light transmission was essentially linear and expressed by the formula $Y = -19.4 + 1{,}365\ x$, wherein Y = an estimate of the number of sperm per 0.0001 cu. mm. of semen and $x = 2$ minus $\log_{10}$ of the galvanometer reading. A variance analysis showed that opacity of semen samples compared with barium sulfate suspensions was sufficiently accurate for field use in estimating sperm numbers. Measures of glycolysis and respiration per unit volume of semen were equally useful indications of viability and quality of ram sperm. A large portion of the sum of the squares for differences in duration of motility of 12 samples of semen from each of 6 rams was associated with variation in reaction rates, but a significant portion was not. The high correlation of 0.937 between the respiration and glycolysis of ram sperm could have resulted from the amount of substrate available for respiration, being dependent on the rate of glycolysis. In another series of semen samples, including 4 from each of 15 rams after 4 days' storage, correlations between 4-day motility and glycolysis and respiration rates were little different. Predictions of motility at 4 days on the basis of respiration and glycolysis were significantly better than by respiration alone, but not better than by glycolysis alone. There were differences between rams in motility at 4 days which were independent of variations in respiration or glycolysis. There was little difference between correlations of glycolysis at 4 days and initial rates of glycolysis and respiration, respectively. Significant differences in the 4-day glycolysis between rams remained after the elimination of differences associated with initial respiration or glycolysis rates. Motility duration was not as accurately predicted from any combination of fresh samples as by direct measurement. Vesicular structure was apparently an important attribute of high quality sperm, but it was not highly correlated with viability. Vesicular structure was found to be equally as frequent on normal and abnormal sperm, and appeared with abnormal tails but not with abnormally formed heads. Because of variations in the effects of several characteristics from one sample to another in semen from the same male, several samples were necessary to estimate the fertility of the ram. The proportion of sperm with normal and abnormal forms with the error of estimate makes such a procedure impractical for ascertaining fertility. The characteristics of semen which did and did not induce conception failed to furnish strong evidence on the actual value of the characteristics concerned for the evaluation of semen quality.

New portable equipment of moderate cost for measuring respiration rate of sperm cells under field conditions is described. The number of sperm with normal morphology and glycolysis was reduced in the summer and early fall in semen samples of 12 Shropshire rams. One-half on full feed were fatter than the other 6

on limited rations, but there were no significant differences in the quality of semen because of treatment. In the second experiment with 3 groups totaling 17 rams, decreases in glycolysis and sperm numbers per unit of semen with higher conditions suggested the probability that high condition by itself had a deleterious effect on the semen quality. In a third experiment, 8 rams were paired on the basis of glycolysis rate, and 1 of each pair was sheared on March 31 and the other of each pair in July. The semen quality as measured by glycolysis rate and sperm numbers was reduced, at least during the early part of the fall breeding season, by long fleece during the summer months. With two semen samples from each ram on March 29, May 2, July 14, and September 29, F values for glycolysis rate and sperm number were 5.69 and 6.43, respectively. A bibliography of 75 references on artificial insemination and physiology of reproduction, with special reference to cattle and sheep, is included.

Spermatogenesis and fertility in Mus muscules as affected by factors at the T locus, V. Bryson (*Jour. Morphol., 74 (1944), No. 1, pp. 131–187, illus. 27*).—Comparison was made of spermatogenesis in 48 testes of mice 5–35 days of age. Group 1 included animals of the genotype $+/+$; group 2 included animals of the genotypes $+/t^1$ $+/t^0$, T/t^1, and T/t^0; and group 3 animals of the genotype t^0/t^1 were prospectively sterile. In addition, testes sections of 59 adult mice possessing all viable combinations of factors at the T locus and seminiferous tubule smears from 27 individuals were included in the study. The sperm preparations included 34 from normal males, 42 from males heterozygous for t^0 or t^1, and 17 males of the t^0/t^1 genotype.

The appearance of normal and abnormal sperm of different genotypes is described. The relation of certain factors to abnormal ratios as transmitted by males heterozygeous for t^0 or t^1 is noted. The following hypothesis is tentatively offered from a combination of genetic and morphological evidence: "(1) When present singly t^0 and t^1 have a dominant effect on the transformation of spermatids into spermatozoa. Defined as partial fertility this effect is selective, resulting in the production of fewer physiologically normal spermatozoa of normal genotype. (2) When present together t^0 and t^1 act additively to produce complete sterility. In t^0/t^1 males the spermatozoa are not only altered in fertilizing capacity and motility but also many are morphologically abnormal."

Treatment of anoestrous of sows with diethylstilbestrol, C. A., V. Barker (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 1, pp. 11–13*).—A 5-mg. dose of diethylstilboestrol dipropionate injected intramuscularly failed to intensify oestrus in an 8-month-old anoestrous sow. Doses of 10 mg. given to three anoestrous sows subcutaneously induced oestrus in from 3 to 7 days. It is concluded that ovulation was probably caused by a 10-mg. dose of diethylstilboestrol.

FIELD CROPS

Estimating forage yield by the double-sampling method, H. G. Wilm, D. F. Costello, and G. E. Klipple. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 3, pp. 194–203*).—Considering field work alone, double-sampling with the line-transect method provided an increase in information of about 28 percent as compared with information obtainable by clipping only during the same time. On the basis of time expended in field and office, double-sampling provided only about 11 percent more information than clipping alone. Use of weight estimates in double sampling provided about 37 percent more information than was obtainable by straight clipping in equivalent field time. If field work and office compilation are both considered, gain in information dropped to about 14 percent. Under conditions of intensive sampling both methods provided substantial economies in field time and

some saving in total time. In large-scale, extensive surveys, clipping of all plats may prove at least as efficient as any short-cut method.

Judging condition and utilization of short-grass ranges on the central Great Plains, D. F. Costello and G. T. Turner. (Coop. Colo. State Col.). (*U. S. Dept. Agr., Farmers' Bul. 1949 (1944), pp. 21+, illus. 10*).—Guides are furnished ranchers for judging prevailing condition of the range, yearly forage production, and current forage utilization of the short-grass range on the central Great Plains. These guides will assist them to use range forage conservatively each year and so to build up depleted ranges and maintain those already in good or excellent condition.

Reseeding eastern Oregon summer ranges, G. D. Pickford and E. R. Jackman. (Coop. U. S. D. A.). (*Oregon Sta. Cir. 159 (1944), pp. 48, illus. 10*).—Experiences from preliminary reseeding tests on Oregon summer ranges are recorded, and pertinent results of studies in similar localities are summarized. Practical information is given on need for reseeding, guides to selecting proper locations, reseeding denuded range lands by drilling and by broadcasting, reseeding burned-off timbered range in the lodgepole pine zone, reseeding from the air, and grass species and mixtures.

Species found well adapted to reseeding summer ranges include crested, slender, bluestem, and bearded and beardless bluebunch wheatgrasses; smooth and mountain bromes; tall oatgrass; big and Kentucky bluegrasses; timothy; orchard grass; meadow foxtail, Alta, meadow, Chewings, and creeping red fescues; and highland and Astoria bentgrasses. Mixtures of several species ordinarily should be sown for best results. Compared with native plants present before the seeding, crested wheatgrass drilled on a dry meadow in Logan Valley produced 70 times more herbage per acre, Kentucky bluegrass and timothy broadcast on a severely depleted bunchgrass range at Bear Wallow produced from 5 to 44 times more herbage, and smooth brome, crested wheatgrass, and Kentucky bluegrass broadcast on Middle Creek Meadows from 5 to 15 times more.

Species found well adapted to reseeding lodgepole pine burns were timothy; orchard grass; Kentucky bluegrass; Alta, meadow, and Chewings fescues; highland bentgrass; smooth brome; and slender wheatgrass. Nursery trials indicated that Astoria bentgrass, creeping red fescue, tall oatgrass, redtop, blue wild-rye, and meadow foxtail are also well adapted for seeding burns at high elevations. Mixtures of Kentucky bluegrass, crested wheatgrass, and timothy, and of orchard grass, mountain brome, and slender wheatgrass broadcast on a lodgepole pine burn on the North Fork of the Malheur River produced from 17.5 to 26.5 times more herbage and reduced the number of lodgepole seedlings 93 percent in comparison with surrounding unseeded burn. Mixtures of Chewings and meadow fescues and highland bentgrass and of Alta fescue, smooth brome, and slender wheatgrass broadcast at a higher elevation in a heavy burn and without a nurse crop failed to establish soon enough to prevent lodgepole seedling encroachment or to arrest harmful erosion, but by the end of the third year, stands were fair and erosion had stopped on the seeded portion while still severe on adjacent, unseeded hillsides.

Intensity of burn has greatly affected lodgepole pine seedling establishment. Counts on unseeded areas revealed an average of 2,795 lodgepole pine seedlings per acre on light burns, 2,439 on moderate burns, and 145 on heavy burns. Beardless bluebunch wheatgrass and mountain and smooth bromes on heavy burns produced from 45 to 71 percent as much herbage per acre as on light burns.

Costs of drilling, including seed, labor, equipment, and ground preparation and needed fencing have ranged about from $1.75 to $3.50 per acre; of broadcasting from $1 to more than $7; and of reseeding lodgepole pine burns from 80 ct. to $2.65 per acre.

Moderate grazing pays on California annual-type ranges, A. L. HORMAY. (Coop. Univ. Calif.). (*U. S. Dept. Agr. Leaflet 239 (1944), pp. 8, illus. 4*).—Moderate grazing, i. e., to a degree that will permit the more desirable forage plants to maintain or increase their abundance and yet be used from year to year, maintains annual-type ranges in good productive condition. Annual-type range, moderately grazed, produces heavier cattle and cattle in better condition than does closely grazed range. Range management practices described are based largely on experiments noted earlier (E. S. R., 87, pp. 661, 694, 698, 732).

Dry land rotation and tillage experiments at the Akron (Colorado) Field Station, J. F. BRANDON and O. R. MATHEWS. (Coop. Colo. Expt. Sta.). (*U. S. Dept. Agr. Cir. 700 (1944), pp. 53, illus. 5*).—Results of crop sequence and tillage method experiments, 1909–38, at Akron, Colo., are reviewed, supplementing an earlier report for 1909–23 (E. S. R., 52, p. 827), and characteristics of the region including soils and climate are described. Suggestions are made on farming systems that promise the maximum returns for labor involved consistent with safety of operation. The findings are applicable to hard-land soils of the west-central Great Plains. In this area livestock production supplemented by crop production appears to be a relatively safe type of agriculture. Cropping systems are built around the chief cash crops winter wheat (E. S. R., 87, p. 511) and Pinto beans (E. S. R., 90, p. 615) and the chief feed crops early-maturing grain sorghums (E. S. R., 82, p. 179) and forage sorghums, barley (E. S. R., 76, p. 470), proso (E. S. R., 78, p. 778), oats (E. S. R., 76, p. 32), and on the sandier land corn (E. S. R., 84, p. 613).

Tillage experiments have shown that winter wheat, the most important crop, should seldom be grown on other than fallowed land, for its yields on cropped land are generally low. Since winter wheat responds to fallow more than do other crops, most fallowed land should be reserved for it. Although sorghums are the most productive feed crop, yields of most crops following them are relatively low. In rotations it is often advisable to grow sorghums for 2 or more years on the same land or to fallow land that has grown sorghums. Crop rotations must have some flexibility so that advantage may be taken of variations in moisture conditions. No method of cropping has eliminated failures or near failures of crops in certain years, yet using crops that make maximum demands for water at different seasons insures against total failure in any 1 yr. The fact that several years of low yields may occur in succession requires accumulation of feed reserves in favorable years. Avoiding preventable water loss and maintaining soil conditions that resist wind (E. S. R., 75, p. 112) and water erosion are deemed integral parts of good cropping systems.

[Farm crops production and weed control in Kansas] (*Kans. State Bd. Agr. Bien. Rpt., 33 (1941–42), pp. 37–55, 92–104, 144–207, 224–225, illus. 40*).—Articles in this paging include The Rise and Decline of Cactus in Kansas, by F. L. Timmons (pp. 37–46) (Kans. Expt. Sta. coop. U. S. D. A.); Broomweed a Pest in Kansas Pastures, by J. W. Zahnley (pp. 47–50), Farm Storage of Wheat in Kansas, by F. C. Fenton (pp. 92–104), and The Grasslands of Kansas, by K. L. Anderson (pp. 144–160) (all Kans. State Col.); The Battle of the Bindweed (pp. 50–55), and Report of the Noxious Weeds Division (pp. 224–225), both by T. F. Yost; Sorghums in Kansas Agriculture, by R. Freeland (pp. 161–167); and Wheat Planting and Wheat Improvement in Kansas, by L. P. Reitz and E. G. Heyne (pp. 168–207) (Kans. Sta. and U. S. D. A.).

[Farm crops research in Mississippi] (*Miss. Farm. Res. [Mississippi Sta.], 7 (1944), No. 4, p. 7*).—Recent results are reported in articles entitled Corn—4 Spacings, 4 Varieties, and 4 Nitrogen Levels, by P. W. Gull and J. Pitner, and Soybean Varieties for Grain—Stoneville, 1943 (coop. U. S. D. A.).

Official variety tests in North Carolina, 1942 (*North Carolina Sta. Agron. Inform. Cir. 131 (1942), pp. [24]*).—Results are reported from the first year's work of a program of crop variety testing initiated in the summer of 1941 to test, at several points in North Carolina, promising new varieties, strains, or hybrids of corn, cotton, soybeans, barley, oats, and wheat.

Official variety tests, 1943: Corn, soybeans, cotton, wheat, oats, barley, R. P. Moore, J. A. Rigney, G. K. Middleton, and L. S. Bennett (*North Carolina Sta. Bul. 343 (1944), pp. 50, illus. 4*).—Crop varieties outstanding in the official variety tests in different localities of North Carolina in 1943 and over several years (listed alphabetically) include the following promising corn hybrids for which commercial seed may be obtained: G703, 713, 715, and 717, Ill. 448, 123M, 977M, N. C. T1, T2, T4, and T12, Tenn. 10, 14, and 15, U. S. 13 and 282, and V120; Coker 100 Wilt, 100, and 200, and Deltapine cotton; Davidson, Randolph, Sunrise, Tenn. 6, and Tennessee Winter barley; Fulwin, Lee 5, Lelina, Letoria, and Stanton oats; Carala, Fulcaster, Hardired, Leap, Nittany, Redhart, and Thorne wheat; and Ogden and Volstate soybeans. The behavior of these and other varieties as shown by yields and other agronomic characters are set forth in tables reporting results of individual tests and averages.

Official variety tests in North Carolina small grains, R. P. Moore and L. S. Bennett (*North Carolina Sta. Agron. Inform. Cir. 132 (1943), pp. 9+*).—Tests of varieties of barley, wheat, and oats in six localities are reported for 1943 and longer periods, with brief varietal descriptions.

Alfalfa and smooth bromegrass for pasture and hay, H. C. Rather and C. M. Harrison (*Michigan Sta. Cir. 189 (1944), pp. 20, illus. 5*).—Alfalfa and smooth bromegrass have proved their value in a mixture widely used for both pasture and hay in Michigan and have been particularly effective in production of pasture during July and August when many pasture plants become brown and dormant and yield little nutritious forage. The mixture also develops a turf preventing soil erosion and benefits crops following in rotation. Practical information on the two plants and their uses and adaptations, cultural and management practices, and the place of the mixture in crop rotations is based extensively on research reported earlier (E. S. R., 77, p. 326; 79, pp. 473, 677; 81, pp. 505, 777; 82, p. 327; 83, p. 101; 86, p. 319; 88, pp. 187, 667).

Compana and Glacier barley: Two new varieties for Montana, S. C. Litzenberger. (Coop. U. S. D. A.). (*Montana Sta. Bul. 422 (1944), pp. 17+, illus. 1*).—Compana, an early, two-rowed, white-seeded, semismooth, thin-hulled barley, selected by H. V. Harlan from a composite cross, is resistant to drought and to loose smut, moderately resistant to covered smut, and less susceptible to grasshoppers than Horn, Trebi, or Glacier. Glacier, a six-rowed, white-seeded, hulled, semismooth-awned variety selected by V. H. Florell from the F_5 of Atlas × Vaughn, is early maturing, resistant to lodging, highly resistant to covered smut, but susceptible to loose smut. Compana was released in 1941 and Glacier in 1943. Tests reported show that Glacier has produced more grain per acre and lodged less than any other variety on both irrigated and the more productive nonirrigated lands. Compana has yielded more than Horn and Trebi in tests on nonirrigated land, particularly on less productive soils or in the drier areas. Under such conditions Compana has produced grain of higher test weight than Glacier or Trebi.

In cooperative malting tests with the Wisconsin Station, Compana grown on irrigated land ranked good as a two-rowed malting variety; it averaged slightly lower in extract or total solubles than most malts from two-rowed barleys. Glacier ranked low in quality, producing a malt with low diastatic power, hazy wort, low wort N, and only a moderately high extract content. Malts from Compana grown on nonirrigated land during 1943 were inferior to those from Compana on irrigated

land. Kernels were decidedly smaller, the extract lower, and the protein and diastatic power higher in grain from nonirrigated land.

Culture of field beans in Michigan, H. C. RATHER and H. R. PETTIGROVE (*Michigan Sta. Spec. Bul. 329 (1944), pp. 38, illus. 14*).—Information on the status of the bean industry in Michigan and the United States; regional and climatic adaptation; rotations; green manures, especially sweetclover (E. S. R., 90, p. 45); fertilizers (E. S. R., 80, p. 475); planting; varieties; diseases (E. S. R., 66, p. 835); cultivation; harvest; and stacking (E. S. R., 76, p. 179) is based largely on research of the station.

Most of Michigan's bean crop is grown on dark-colored, heavy soil, best yields usually being obtained on the rich Brookston soils of the Saginaw Valley and the Thumb district. Beans should not follow beans in the crop rotation, which preferably includes alfalfa, sweetclover, or red clover. Green manure, as sweetclover, has benefited beans and other crops following beans in rotation. Planting rates and dates found desirable are for white pea beans 40 lb. per acre and Cranberry beans 60 lb., both on June 1–10, and Red Kidney beans 80 lb. on June 15–20. Although 21- and 24-in. rows outyielded 28 in., they had certain operational disadvantages. Best yields of both white pea beans and Red Kidney beans were secured by drilling one seed every 3 in. Yield considerations and weed and harvest problems have made the solid planting and direct combine harvest of beans impracticable. Special inoculation of bean seed appears to be unnecessary in the regular bean-growing areas of the State. Michelite (E. S. R., 80, p. 335) currently is the best white pea bean for Michigan, and like its parent Robust is immune to mosaic. Blight, wilt, and anthracnose are controlled most effectively with disease-free and resistant varieties. Cultivation to control weeds without pruning the bean roots as the plants advance in maturity is essential. Cultivation procedure with spike-tooth harrow or weeder is outlined. Most of the crop should be ripe during September. Data, 1929–42, show a striking relationship between September rainfall and the average percentage of cull beans in a given crop.

Smooth bromegrass seed production in Michigan, B. R. CHURCHILL (*Michigan Sta. Cir. 192 (1944), pp. 22, illus. 10*).—Effective cultural and harvest procedures suggested for growing smooth bromegrass (*Bromus inermis*) for seed have been developed extensively from station research. Seed may be harvested from bromegrass-alfalfa mixtures or from pure bromegrass stands. In pure stands for seed, bromegrass 0.5 bu. is mixed with oats 0.5 bu. and sown in early August in 30- to 36-in. rows shallow on a firm, clean seedbed. A mixture of bromegrass 5–7 lb. and alfalfa 6–8 lb. per acre has proved very satisfactory for pasture, hay, or bromegrass seed. For pure stands of bromegrass from 300 to 400 lb. per acre of 0–20–20 fertilizer is applied before seeding or a 3–12–12 if the soil is low in N. A top dressing of from 200 to 300 lb. of ammonium sulfate or similar N carrier (E. S. R., 86, p. 319) is added each spring. If bromegrass is grown with alfalfa, fertilization is at time of seeding to meet requirements of alfalfa. The crop should be combined as high as possible when most seed are brown and some stems are yellow for a few inches below the panicle. Forage remaining after seed harvest may be pastured or cut for hay. The composition of bromegrass seed is compared with that of oats and barley.

South Dakota corn performance test, 1943, J. E. GRAFIUS and E. R. HEHN (*South Dakota Sta. Cir. 50 (1944), pp. 21+, illus. 1*).—Continued tests involving 144 corn hybrids and open-pollinated varieties in different sections of South Dakota are reported on as in the previous year (E. S. R., 89, p. 662).

The 1943 Virginia corn performance tests, M. H. MCVICKAR (*Virginia Sta. Bul. 358 (1944), pp. 8, illus. 1*).—Data on acre yields and other agronomic characters are reported for corn hybrids and varieties grown in performance tests

at 11 places in Virginia in 1943. Hybrids are recommended for each of 7 general sections of the State.

Dew drop "grass" as a lawn plant in central Missouri, W. B. Drew. (Univ. Mo.). (*Ecology, 25 (1944), No. 2, pp. 246–247*).—Dewdrop grass (*Dichondra repens*) in the field or lawn has not remained green throughout the winter in central Missouri and is completely killed during periods of low temperatures. Minimum air temperatures of 25°–26° F. sufficed to cause severe cold injury of many leaves, and 10°–15° apparently resulted in death of most of the foliage, despite a thin snow cover. Air temperatures below 0° and a soil temperature of 24° resulted in ultimate death of all plants. Dewdrop grass does not reseed successfully in the spring in central Missouri, and under the climatic conditions is definitely not adaptable as a lawn plant.

The influence of seasonal conditions on oil formation and changes in the iodine number during growth of flaxseed, E. P. Painter, L. L. Nesbitt, and T. E. Stoa. (N. Dak. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 3, pp. 204–213, illus. 3*).—Flax varieties grown at Fargo, Langdon, and Edgeley, N. Dak., in 1941 and 1942 differed slightly in oil content, but the I number of 1942 oil samples averaged over 20 points above that of 1941 samples. July maximum, as well as average temperatures, were much higher at each location in 1941 than in 1942. The data indicated that I number is influenced much more by temperature than by rainfall. Flax blossoms tagged at Fargo each season and samples harvested at regular intervals revealed that oil deposition was rapid each year. The I number increased rapidly in 1942 during rapid oil formation, but in 1941 it increased until about 12 days after blossoming, then decreased. The decrease was during the period of rapid oil formation and came before onset of high temperatures. Unrecognized environmental factors appear to influence the I number. Whether or not high I number linseed oils are produced appears to depend upon the duration of the period of increase. The initial rate of increase of I number is rapid when flax is grown under unfavorable growing conditions, but increase is inhibited at an early stage of growth. Oil, however, continues to be deposited in the seed under conditions inhibiting increase in I number. When the season is very unfavorable, presumably due to a combination of drought and high temperatures, oil formation may also be inhibited.

Methods of increasing the germination of koa haole seed, E. K. Akamine (*Hawaii Sta. Cir. 21 (1942), pp. 14, illus. 3*).—Delayed germination of koa haole (*Leucaena glauca*), a legume used for livestock feed (E. S. R., 83, p. 808), is due to the impermeable nature of the seed coat. Mechanical scarification or treatment with 52 percent sulfuric acid has resulted in germination of more than 90 percent and hot water scarification above 70 per cent compared with from 10 to 15 percent from untreated seed. Mechanical scarification is recommended for large quantities of seed and acid or hot water scarification for small to fairly large quantities. Hot water-treated seed should not be stored longer than 6 mo. before planting. Acid-treated and mechanically treated seed may be safely held for 2 yr.

Improve permanent pastures with lespedeza, phosphate, lime, and supplementary grazing, E. M. Brown. (Coop. U. S. D. A.). (*Missouri Sta. Cir. 285 (1944), pp. 8, illus. 4*).—Acre yields of animal products from permanent pastures may be increased materially and profitably by increasing the quantity and improving the quality of forage produced and by managing grazing so that available forage will be fully consumed during seasons when it is more nutritious. Productivity of the pasture can be increased and forage quality improved by applying phosphate and lime to soils lacking these minerals and by establishing a legume, as lespedeza, in the grass sod. To use forage produced by the permanent pasture with maximum efficiency, supplementary pastures must be provided and used during much of the

summer and fall. Lespedeza or Sudan grass are for summer supplementary pasture and early-sown winter barley or rye or first-year sweetclover for use during October and November. Cultural practices and grazing management based on station research are outlined.

Timothy-lespedeza mixture, C. A. HELM (*Missouri Sta. Cir. 288 (1944), pp. 4, illus. 1*).—Practical instructions are given on growing and managing timothy-lespedeza mixture for pasture, hay, and seed. Cattle days of pasture and pounds gain, 1938–43, on timothy-lespedeza pasture in three localities are tabulated.

A new era in oat production, R. R. MULVEY (*Indiana Sta. Cir. 296 (1944), pp. [4]*).—Tama oats, averaging 74.8 bu. per acre, and Vicland, 74.4 bu., made the highest average and annual yields in tests at La Fayette, 1941–43. Comparative yields and other agronomic data are tabulated, and the merits of these and other varieties for Indiana conditions are discussed.

Progress report of potato research, Aberdeen Experiment Station, J. E. KRAUS (*Idaho Sta. Cir. 88 (1944), pp. 8*).—Progress results are again (E. S. R., 87, p. 664) reported from potato experiments concerned with methods of handling potato seed before and after cutting; size of seed piece; merits of different stocks, large plant types, and causes of second growth, all with Russet Burbank potatoes; yields and other characteristics of varieties; influence of soil moisture, time of planting and harvest, and fertilizer balance as factors in jelly-end rot; improvement of seed stocks of Russet Burbank and Bliss Triumph; hastening maturity of tubers by killing vines; relation of tuber maturity to shrinkage; and storage of commercial and seed potatoes.

Choosing lands and fertilizers for potatoes, F. M. HARRINGTON (*Montana Sta. War Cir. 8 (1944), pp. [4]*).—Potatoes on soils low in organic matter were not benefited much by phosphate alone but needed heavy N applications, as in ammonium sulfate or ammoniated phosphate. Addition of manure or green manure, as sweetclover, or land in alfalfa, especially when a good top crop was plowed under, provided good conditions for potatoes. Irrigation water was used more effectively for potatoes on fields formerly in sod.

Soil fertility factors affecting soybean yield, W. H. PIERRE. (Iowa Expt. Sta.). (*Soybean Digest, 4 (1944), No. 6, pp. 12–13*).—High yields of soybeans can be made only on fertile soil; they definitely are not a poor-land crop. Although soybeans do not respond as well as alfalfa or corn to direct applications of P and K, experiments of the Iowa, Illinois, and other Midwest stations show that they return higher yields with good soil management practices. Use of lime and fertilizers in the rotation where needed, contouring on rolling soils, and especially use of manure contribute to high acre yields.

Soil conservation aids soybean production (*U. S. Dept. Agr., 1944, AWI-92, pp. 8, illus. 10*).—Soybeans, according to experiments cited and illustrated, if grown on sloping land subject to erosion, should be drilled solid or drilled and cultivated on the contour and not planted in wide rows up and down the hill, and should replace rather than follow corn in the rotation. Soybean land should be protected from erosion after harvest; a winter grain crop should be sown between the bean rows before pods are set or just behind the combine.

Edible soybeans in Nebraska, J. M. SLATENSEK and T. A. KIESSELBACH. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 356 (1944), pp. 10, illus. 2*).—Bansei, Mendota, Kanro, and Jogun, outstanding in tests of edible soybean varieties, together with the field varieties Illini and Dunfield, are recommended for planting in Nebraska. Methods for growing, harvesting, and preserving the crop are outlined, together with information on palatability and nutritive value of soybeans and agronomic characteristics of 13 important edible varieties and Illini.

Soyas para Puerto Rico (datos preliminares) [**Soybeans for Puerto Rico (preliminary report)**], A. Riollano and J. Pastor Rodríguez (*Puerto Rico Univ. Sta. Mimeog. Rpt. 26 (1944), Span., pp. 7+*).—Of the three varieties of soybeans (E. S. R., 88, p. 476) found well adapted to the varied soil and climatic conditions of Puerto Rico, Seminole has been outstanding in yield of seed and forage and as an edible soybean; Palmetto also has been a good general-purpose bean, while Otootan is used only for forage.

Curing and storage methods in relation to quality of Porto Rico sweetpotatoes, J. M. Lutz (*U. S. Dept. Agr. Cir. 699 (1944), pp. 12, illus. 2*).—Curing studies, 1940–43, at Meridian, Miss., showed that during the curing of Porto Rico sweetpotatoes ventilation is generally nonessential, wastes heat, and causes relative humidities too low for proper curing. Such improperly cured sweetpotatoes keep poorly in storage. The best practice seems to be to use enough ventilation during curing to prevent condensation of moisture on the roots and on the ceiling and sides of the storage house. Circulation of air during curing seems unnecessary and may be injurious. Temperatures of 80°–85° F. and relative humidity of 85–90 percent are recommended during curing (10–14 days), and 50°–55° and 80–85 percent, respectively, during the subsequent storage period. Sweetpotatoes stored at a minimum temperature of 50° after curing were of higher table quality than those stored at minima of 40° and 30°. Those stored at 40° did not differ significantly in keeping quality from those stored at 50°, while sweetpotatoes stored at 30° decayed much more. Careful handling prior to curing was important in reducing losses during curing and storage.

Tobacco Substation at Windsor, report for 1943, P. J. Anderson, T. R. Swanback, and S. B. Lecompte, Jr. (*Connecticut [New Haven] Sta. Bul. 478 (1944), pp. 87–117, illus. 4*).—Experiments with cigar-leaf tobacco (E. S. R., 89, p. 442) reported on dealt with efficiency of N in oil meals, fertilizer placement and time of application, and black tobacco. Incidence and control of diseases are noted on pages 428 and 429 of this issue.

The relative efficiency of nitrogen in oil seed meals, T. R. Swanback (pp. 93–100).—The relative crop-producing values were not reflected correctly by chemically determined N percentages in cottonseed meal (6.5), castor pomace (5.5), and soybean meal (7.2). When each meal furnished equal amounts of N, there was more than a third more nitrate in the soil during the growing season where castor pomace or soybean meal was used compared with cottonseed meal. Their crop-producing capacities (measured by yield and grading) also showed large differences in the same direction but not exactly proportional to nitrate production. Compared with N 200 lb. in cottonseed meal, equal crop results were produced by 160 lb. in castor pomace and by 170 to 180 lb. in soybean meal. Undesirable effects of castor pomace and soybean meal, sometimes observed by growers, are thus explained as due to a too generous supply of nitrate in the soil; this also explains the difference in their behavior on light and heavy soils.

Timing the fertilizer application (pp. 100–103).—Applying the fertilizer on the same day as setting the plants, 1940–43, has produced as good results as application from 7 to 10 days before transplanting.

Plowing under the fertilizer (pp. 103–105.—Under conditions prevailing in 1943 on a field of Merrimac coarse sandy loam, the "plow-under" method of incorporating the fertilizer (2,500 lb. per acre of 8–4–8) gave a decided increase in yield—with some reduction in grade—and it had the distinct advantage of producing a more uniform stand of plants.

Winter wheat varieties in Illinois, G. H. Dungan (*Illinois Sta. Cir. 563 (1943), pp. 4*).—The six commercial varieties that have yielded highest in tests (E. S. R., 82, p. 616) in each of three sections of the State are listed and described,

with special mention of their strong and weak points. Highest-yielding commercial varieties listed in the order of their superiority over the average of all varieties grown the same years, with mean yield, are for northern Illinois (DeKalb and Mt. Morris) Kawvale 27.8 bu., Marmin 31.5, Minturki 30.1, Ioturk 28.7, Purkof 30.6, and Wisconsin 2 28.2 bu.; central Illinois (Urbana) Kawvale 40.2, Tenmarq 37.8, Brill 37.6, Clarkan 37.5, Cheyenne 35.4, Wisconsin 2 36.4, and Prairie 32.9 bu.; and for southern Illinois (Alhambra) Fulcaster 24.9, Brill 23.6, Purdue 1 24.1, Clarkan 20.6, Fairfield 13.4, and Nabob 22.8 bu. Fulhio 22.2 bu. is also well adapted to southern Illinois.

Mida wheat, a new hard red spring variety, L. R. Waldron, R. H. Harris, T. E. Stoa, and L. H. Sibbitt (*North Dakota Sta. Cir. 68 (1944), pp. 16*).—Mida, a new productive, awned, hard red spring wheat released in 1944, has, in North Dakota field plat trials since 1939, made higher average yields than Pilot, Rival, Thatcher, and Renown. The variety has stronger straw than Rival and heads a day earlier; has large, dark-red kernels with high test weight and threshes easily; and has shown high resistance to leaf and stem rusts and to stinking smut. Mida has been found satisfactory in milling and baking studies. Its protein content and flour yield have been slightly above those of Thatcher, while its loaf volume is below that of Thatcher and equals that of Rival. The low flour ash content of Mida is an advantage, and color of crumb is excellent. Formerly designated as Ns 2829, Mida was developed in cooperation with the U. S. Department of Agriculture and other agencies out of a cross between a selection from the three-way cross Ceres × (Hope × Florence) and a Canadian wheat, R. L. 625. Mida, when introduced, probably will, it is thought, displace considerable acreages of Rival, Pilot, and Vesta.

Proceedings of the Association of Official Seed Analysts, 1942 (*Assoc. Off. Seed Anal. Proc., 34 (1942), pp. 160, illus. 39*).—Papers presented at the thirty-fourth annual meeting at Lexington, Ky., July 28–31, 1942, included Report of Research Committee, by G. P. Steinbauer et al. (pp. 16–24) (Maine Expt. Sta. et al.); Crop-Producing Value of Discolored Alfalfa Seed in Montana, 1941 Crop—Correlation of Laboratory and Field Tests, by W. O. Whitcomb (pp. 28–31), and Analysis of Seed With the Rice Laboratory Seed Cleaner—Preliminary Tests, by W. O. Whitcomb and B. B. Thompson (pp. 70–72) (both Mont. Sta.); Report of the Subcommittee on Methods for the Analysis of Small Seeds, by L. A. Kanipe (pp. 32–40) (Oreg. State Col.); Report of the Subcommittee on Phytopathological Technique, by W. D. Day (pp. 40–42); Report of the Subcommittee on Range Grass Seed Studies, by E. L. Norris and A. E. Decker (p. 43), and Identification of Sorghums, by E. L. Norris (pp. 151–155) (both Kans. State Col.); Report of Chairman of Subcommittee on Sand Tests, by C. W. Leggatt (pp. 44–46); Dodder Observations, by G. E. Miller (pp. 47–48) (Univ. Mo.); Germination of Green Foxtail Seeds, by A. C. Heise (pp. 48–49); Wild Onion Bulblets, by D. Hooker (pp. 49–50); Federal Seed Law Administration, by W. A. Davidson (pp. 58–63), and Distinguishing Characters of the Seeds of Four Species of *Agropyron* (pp. 124–131), Seeds of Commercial Species of *Brassica* (pp. 132–138), and Diagnostic Characters of Seed of the Commercial Species of *Agrostis* and Certain Species Occurring Incidentally With Them (pp. 139–151), all by A. F. Musil (all U. S. D. A.); State Seed Law Administration, by C. N. McIntyre (pp. 63–65); International Analysis Certificates Prove Efficient, by B. Cullinan (pp. 67–68), Weed Trends in Red and Alsike Clover Seed Since 1911, by L. Everson (pp. 68–69), Snow-on-the-Mountain (*Euphorbia marginata*) Seed Data—A Rapid Method of Detecting Viability, by C. E. Heit (pp. 78–82), Germination Response of Vernalized *Taraxacum* Seed, by M. T. Munn (pp. 88–90), Comparative Laboratory and Field Germination of Onion Seed, by B. E. Clark (pp. 90–99), Materials and Methods in Controlling Seed-Contaminating Microorganisms (pp. 104–108) and Baldheads in

Beans, Occurrence and Influence on Yields (pp. 118–123), both by W. Crosier, and Persistent Hardseededness in Early Perfectah Peas, by W. Crosier and S. Patrick (pp. 114–118) (all N. Y. State Sta.); Dallis Grass Seed Analysis, by M. S. Munn (pp. 72–76); Treatment of Multiple Florets, by R. H. Porter (p. 77) (Iowa State Col.); Experiments in the Development of Bluegrass Seed, by E. N. Fergus (pp. 77–78) (Ky. Sta.); Toxicity to Seedlings of Zinc From Germinator Trays, by H. L. Munn and E. V. Staker (pp. 82–88) (N. Y. State Sta. and Cornell Univ.); Onion Seedlings Devoid of Root Hairs, by G. E. Nutile (pp. 99–103); Viability of Bulblets of *Allium canadense* and *A. vineale* Occurring in Seed of Cereals and Crimson Clover (A Progress Report), by O. L. Justice and M. D. Whitehead (pp. 109–114); and Comparison of Iowa Air-Blast and Kentucky Seed Blower, by E. C. Vaughn (pp. 156–157).

Control and eradication of European bindweed, A. L. Bakke. (Coop. U. S. D. A.). (*Iowa Sta. Bul. P61 (1944), pp. 937–960, illus. 7*).—Control methods for European bindweed by cropping measures and chemical treatments and in bluegrass lawns are based extensively on experiments during 10 yr. at Hawarden and Cherokee, Iowa. See also earlier reports (E. S. R., 81, pp. 644, 786; 82, p. 41).

Extermination of bindweed by fallowing requires cultivation for 3 consecutive years at 10- to 12-day intervals throughout the growing season. Sorghum, in particular, and Sudan grass and millet are effective smother crops when heavily seeded for several years on bindweed-infested areas. Soybeans seeded solid, from 3 to 3.5 bu. per acre, for 5 consecutive years on bindweed-infested ground given intermediate cultivations and plowed just before planting the soybeans and shortly after their harvest, will completely eradicate bindweed. Continuous cropping of winter wheat or winter rye on bindweed-infested ground with intermediate cultivations reduces bindweed population, and alfalfa can be grown satisfactorily upon infested ground and will hold bindweed in check but neither practice will eradicate it. Grazing with sheep and hogs has not proved successful in eradicating bindweed.

Sodium chlorate and Atlacide have been the most effective chemicals to use in eradication. The "smother crop" method has proved to be effective. Dry sodium chlorate used to eradicate bindweed must be distributed evenly for best results. Alfalfa, sweetclover, and flax are tolerant of sodium chlorate, while soybeans are extremely sensitive. Carbon disulfide and tetrachlorethane when injected into the soil and ammonium sulfamate applied as a spray are also effective with bindweed.

In bluegrass lawns European bindweed may be eradicated by using sodium chlorate as a spray or placed in holes or injecting the soil with tetrachlorethane. Bindweed in new lawns should be eradicated before dirt fills and plantings are made.

Wild onion and wild garlic control, L. V. Sherwood (*Illinois Sta. Cir. 572 (1944), pp. 7+, illus. 1*).—Wild garlic (*Allium vineale*) and wild onion (*A. canadense*), described with control measures, causes losses in dockage in wheat, unsalable dairy products, and unmarketable meats estimated to amount in southern Illinois to at least $500,000 a year. Control measures on crop areas include sowing only crop seeds free from these weeds; using a cropping system that will kill the underground bulbs and prevent the growth of aerial bulblets—including crops permitting or requiring fall plowing, cultivated crops, and spring-seeded rather than fall-seeded small grains; getting rid of these weeds on higher fields first; avoiding contaminated hay, straw, or barnyard manure on or near clean soil and the scattering of plants or bulblets by cultivation implements; using clean threshing machines; and cleaning up fence rows and waste places. Oils or chlorates are effective on small areas, and pulling is the best method of ridding lawns and gardens of these weeds.

HORTICULTURE

Propagation of plants: A complete guide for professional and amateur growers of plants by seeds, layers, grafting, and budding, with chapters on nursery and greenhouse management, M. G. KAINS and L. M. MCQUESTEN (*New York: Orange Judd Pub. Co., 1943, rev. and enl. ed., pp. 639+, illus. 375*).—This is a revised and much enlarged edition of the manual and textbook previously noted (E. S. R., 35, p. 642). "The text has been so arranged that the propagator . . . can get a clear exposition of whatever subject interests him, without being annoyed by pedagogical material. On the other hand, the teacher, the experimenter, and the student will find abundant reference to text and illustrations in the 50 practicums placed toward the close of the book." Plant lists and condensed rules for propagation are included. The index not only covers the text but also lists the tables, section subjects, illustrations, important variety names, institutions, and authors whose work has been cited.

Effect of boron, copper, manganese, and zinc on the enzyme activity of tomato and alfalfa plants grown in the greenhouse, L. F. BAILEY and J. S. MCHARGUE. (Ky. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 1, pp. 105–116, illus. 5*).—In the leaves of the Marglobe tomato, maximum catalase and invertase activity occurred with 0.01 p. p. m. of copper in the nutrient solution. Above this point both enzymes decreased in activity. Oxidase activity increased with each successive addition of copper. Peroxidase was the only enzyme which failed to respond positively to any copper addition. In tomato fruits catalase and peroxidase activity diminished progressively with increasing copper, and invertase gave an opposite response. In boron studies with alfalfa, all the enzymes gave maximum responses with 1.0 p. p. m., except peroxidase which reached a maximum activity at 0.25 p. p. m. Plant growth with no added boron was insufficient for analysis. Invertase activity showed an increase of over 100 percent at the 1.0 p. p. m. boron level. In zinc studies with alfalfa, catalase, peroxidase, and oxidase gave pronounced optimum activities at 1.0 p. p. m. Invertase showed minimum activity at this level. Studies of the relation of manganese to enzyme activity in alfalfa showed a depressing effect in the concentrations used with one exception, namely, peroxidase showed a marked favorable response at 1.0 p. p. m.

Electrodialysis of seeds, J. D. NELLY (*Plant Physiol., 19 (1944), No. 1, pp. 19–32, illus. 2*).—Electrodialysis was carried out in a Mattson cell, using parchment paper membranes, a copper grid cathode, and a carbon anode. A direct current of 80–150 v. was supplied by either a rectifier or a D. C. line. The germination of Laxton Progress and Alaska pea seeds and of red kidney beans was markedly decreased by the treatments. Electrodialysis had a great inhibiting effect on the production of carbon dioxide following treatment. Calcium, magnesium, and potassium were all lost at a much greater rate from the treated Laxton Progress seeds than from the controls. Cations removed from all the lots of seeds studied were more than equivalent to the removed anions. There was no sulfate ion present in the ash of Laxton Progress pea seeds treated for 2 hr. or more at 150 v. Electrodialysis of Alaska pea seeds for 2 hr. at 80 v. was followed by a very low ascorbic acid content during the early stages of germination, but by the end of the fourth day the treated seeds contained nearly as much ascorbic acid as did the controls.

Relative effects of superior vs. inferior seed-branch positions in cabbage on time of seedstalk initiation in the immediate progenies of inbred plants, L. R. DETJEN and W. H. PHILLIPS (*Delaware Sta. Bul. 245 (1943), pp. 21, illus. 11*).—Premature seedstalk formation (bolting) in cabbage is classified into three categories—environmental, physiological, and genetical. There was noted on a single cabbage plant a difference in the time of seedstalk formation between an upper

and a lower branch. Studies of this phenomenon led to the conclusion that the average date of seedstalk formation was influenced definitely by seeds which developed on branches from upper as opposed to lower positions on the main stem. Because of the horticultural significance of bolting, the selection of seed from upper or lower branches assumes practical importance. The delay in seedstalk initiation in progenies grown from lower stem positions did not rest apparently on differences in quality or nourishment of seeds as represented by average size. The authors suggest that variability in physiological processes, due perhaps to some hormone type of action that is associated with comparative height levels on the primary stem, influenced apparently the time of seedstalk initiation.

Lettuce varieties and culture, R. C. THOMPSON (*U. S. Dept. Agr., Farmers Bul. 1953 (1944), pp. 38+, illus. 15*).—This supersedes Farmers' Bulletin 1609 (E. S. R., 62, p. 340) and presents general information on types and varieties; factors influencing field production; selection, preparation, and improvement of soils; importance of good seed; methods of planting; diseases; insects; etc.

The effect of staking and pruning on tomato plants, A. RIOLLANO (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1943), No. 1, pp. 17–26, illus. 2; Span. abs., p. 26*).—Studies with Marglobe tomatoes grown under irrigation showed that pruning and staking under such conditions have a tendency to decrease total marketable yields without affecting favorably size, quality, or earliness of fruit.

Nematode-resistant rootstocks for deciduous fruit trees, L. H. DAY and W. P. TUFTS (*California Sta. Cir. 359 (1944), pp. 16, illus. 4*).—This summarizes 15 years' experimentation designed to adapt deciduous trees to soils heavily infested with root-knot nematode (*Heterodera marioni*). Under conditions of these trials, seedlings of 48 varieties of apricot were practically immune. Of 180 peach and 44 nectarine seedlings, many proved highly susceptible, several showed considerable resistance, but none were completely immune. In 10 years' orchard trials, seedlings of Shalil, Bokhara, and Yunnan gave promising rootstocks for peaches and almonds in nematode-infested sandy soils. Myrobalan plum seedlings were susceptible, though several were immune; Marianna plum and several vigorous seedling selections of this hybrid were immune. All of the above immune plums propagated readily by stem cuttings. Results of tests of a number of other plum species, varieties, and hybrids were reported. Mazzard cherry and Stockton morello (grown from rooted cuttings) were immune; mahaleb cherry seedlings were lightly affected. Seedlings of all the common almond varieties were very susceptible, though a few individual seedings were not affected. Seedlings of Winter Nelis pear were lightly affected, while Delicious apple seedlings and several quince varieties, grown by cuttings, were immune. Seedlings of English (Persian) and northern California black walnuts were moderately affected.

Solving the spray timing riddle, A. C. HODSON and E. G. SHARVELLE (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 3, pp. 12–13, illus. 2*).—Improper timing of sprays is said to outrank any other factor as a cause of failure to control insects and disease in Minnesota orchards. Careful records taken during 1943 on the stage of development of the tree and fruit on the one hand and on the status of various fungus and insect enemies on the other showed the importance of correlating sprays with actual conditions prevailing in an orchard. The use of a timetable based on seasonal changes in the leaf, flower, and fruit was much more satisfactory than following calendar dates.

Pioneer goals passed in fruit breeding, W. H. ALDERMAN (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 3, pp. 2–3, illus. 5*).—A total of 52 varieties of apples, pears, plums, grapes, gooseberries, currants, strawberries, and raspberries has been produced and introduced by the station from its Fruit Breeding Farm. The principles and practices employed in the development of new fruits are

discussed, and certain of the outstanding productions, such as the Haralson apple and the Latham raspberry, are given special consideration.

A study of the Sweet-and-Sour apple chimera and its clonal significance, V. R. Gardner. (Mich. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *68* (*1944*), *No. 10, pp. 383–394, illus. 6*).—A brief historical account of this multiorigin form, covering a period of 150 yr., is presented, together with a detailed study of one particular clonal form. A technic is described for differentiating sharply between masses of tissue of different degrees of acidity within the apple. Study of the distribution of tissue of varying acidity shows that the Sweet-and-Sour type is a chimera that does not follow any of the standard patterns, such as sectorial and periclinal. The trees themselves, as well as the fruits, were found to be chimeral in nature and subject to great variation.

New peach varieties for a subtropical climate, J. W. Lesley. [Univ. Calif.]. (*Calif. Citrog., 29* (*1944*), *No. 5, p. 138*).—Peaches must be selected with care for growing in subtropical areas because most varieties require a considerable period of low temperature during the dormant season. Fortunately there are certain varieties, particularly those derived from the Peento group, which need only a short period of low-temperature exposure. Among such varieties are Babcock, Robin, Redbird (= Early Wheeler), Weldon, Hermosa, Sunglow, and Fontana.

Blueberry growing, G. M. Darrow, R. B. Wilcox, and C. S. Beckwith. (Coop. N. J. Expt. Stas.). (*U. S. Dept. Agr., Farmers' Bul. 1951* (*1944*), *pp. 38+, illus. 23*).—This supersedes Leaflet 201 (E. S. R., 84, p. 762) and presents a comprehensive discussion of species, high-bush varieties and their culture, blueberry insects and diseases and their control, etc.

Winter behavior of strawberry plants, W. G. Brierley and R. H. Landon (*Minnesota Sta. Bul. 375* (*1944*), *pp. 24, illus. 6*).—During the frosts of late autumn strawberry plants were found to gain in hardiness, but exposure to premature severe freezes may cause much injury. Studies with potted plants held at 32° F. showed that some activity, as measured in carbon dioxide output, proceeds throughout the winter season. A minimum of activity was reached in late March just prior to the onset of spring. Experiments carried on over several years with matured and hardened plants showed that the June-bearing varieties are able to withstand exposure for 24 hr. to temperatures of 21° with little or no injury. At 16° injury varied from slight to severe, but the killing point was reached apparently at about 10°. Varieties differed in hardiness, with the June bearers as a group being more hardy than the autumn fruiters. Of all varieties tested, Burgundy, a new strawberry bred by the station, was hardiest. That dormant strawberry plants have a great capacity to survive under a coating of ice was shown in laboratory experiments in which plants placed in sealed jars were held at 27°. Even at 2 percent oxygen, only slight injury occurred during the 7-week period. Where ice was maintained over strawberry plants for several weeks, no severe injury was observed that could be attributed to the ice alone. In ordinary winters it was evident that a 3-in. layer of mulch was adequate to protect against low-temperature injury. It was highly important that the placing of mulch be timed properly, preferably after light frosts had occurred in the fall but before outdoor temperatures dropped below 20°. Snow on the mulch was effective in supplying additional protection. Some evidence was obtained to show that strawberry plants rehardened against frosts occurring during the early stages of growth in the spring.

Studies in tropical fruits, XIV, XV, H. R. Barnell (*Ann. Bot.* [*London*], *n. ser., 7* (*1943*), *Nos. 25, pp. 1-22, illus. 9; 28, pp. 297–323, illus. 12*).—In continuation (E. S. R., 87, p. 63), the following contributions are included:

XIV. *Carbohydrate metabolism of the banana fruit during storage at 53° F.*—The changes in amounts of dry matter, starch, sucrose, glucose, fructose, glycosidic

glucose, and titratable acidity were followed in the pulp and skin of detached bunches of Gros Michel bananas of commercial grade during a 99-day storage period at 53°, and the detailed findings are reported. The differential effects of temperature on the metabolic processes of the banana are considered, and suggestions based on present knowledge and hypotheses are made for future investigations on storage and ripening.

XV. *Hemicellulose metabolism of the banana fruit during storage and ripening.*—Changes in the amounts of hemicellulose and cellulose in the pulps and skins of two commercial grades of the same variety were determined during short or long storage at 53°, followed by ripening at 68° and also, for one grade, during continuous storage at 53°; specific results are presented and discussed. The pulp of green bananas contained 8–10 percent fresh weight of hemicellulose, which declined rapidly to 1–2 percent during ripening. The rates of hydrolysis of hemicellulose and starch at 53° were slow prior to onset of changes constituting ripening. Incidence of the change from slow to rapid hydrolysis of hemicellulose at 53° or 68° coincided with that of the increased rate of starch hydrolysis, which also synchronized with the increased rate of sugar formation. Once the changes accompanying ripening were initiated, the new increased rate of hemicellulose hydrolysis was apparently unaffected by temperature, as contrasted with the relative rate for starch. Thus studies designed to extend the storage life of bananas should include attempts to reduce the hemicellulose hydrolysis rate to preserve the balance with that of starch. The pulp of green fruits contained 1–3 percent fresh weight of cellulose; this changed but little in storage at 53°, but at 68° a slight decrease occurred.

The skin contained much less hemicellulose than the pulp, and the decrease in absolute amount during ripening was relatively small. No appreciable differences were noted in the absolute amounts of hemicellulose between the long- and short-stored fruit, though the decrease in water content was sufficient to produce differences in the percentage data on the basis of fresh weight. Cellulose showed no appreciable change in absolute amount in the skin either at 53° or at 68°, but decreases in water content were sufficient to produce increases and differences in percentage amounts between long- and short-stored fruit when ripe. The amount of hemicellulose disappearing without equivalent increase in sugars in the banana finger during ripening was more than adequate to account for the loss of total dry matter during this period. It is suggested that some hydrolysis products of hemicellulose serve as substrates for respiration, while others, on oxidation, give rise to dibasic acids.

The citrus industry.—I, History, botany, and breeding, edited by H. J. Webber and L. D. Batchelor (*Berkeley: Univ. Calif. Press, 1943, vol. 1, pp. 1028+, illus.* [*235*]).—This comprehensive text, prepared by members of the staff of the California Experiment Station assisted by others, presents a well-considered discussion of the history, botany, nutrition, and genetics of the citrus group.

Effects of iron on chlorophyllous pigments, ascorbic acid, acidity, and carbohydrates of Ananas comosus (L.) Merr., supplied with nitrate or ammonium salts, C. P. Sideris and H. Y. Young. (Pineapple Res. Inst. Hawaii). (*Plant Physiol., 19 (1944), No. 1, pp. 52–75, illus. 16*).—Studies made upon pineapple plants grown for 12 mo. in constantly aerated solution cultures supplied with equal amounts of nitrate- or ammonium-nitrogen and with or without iron showed that chlorophyll and carotenoid pigments were higher in the leaves of the plus-iron than the minus-iron cultures. Titratable acidity gradients reported as citric acid increased from the basal to the terminal sections of the leaves of the plants of all cultures. Ascorbic acid was almost limited to the chlorophyllous sections of the leaves, although the amounts present were not directly proportional to those of chlorophyll in the plants of the different cultures. Reduction of the ascorbic acid values in old leaves of the plus-iron cultures suggests a possible oxidation by iron.

Sugars were found in greater amounts in the leaves of the old, mature, and active groups of the plus-iron than the minus-iron cultures. They were higher in the plants of the nitrate- than of the ammonium-nitrogen series. The amounts of levulose were slightly higher in the leaves of the minus-iron than the plus-iron cultures of the nitrate-nitrogen series. Sucrose was higher in the leaves of the plus- than the minus-iron plants of the nitrate series, but in the ammonium series it was as high or slightly higher in the minus-iron than in the plus-iron cultures. Starch was consistently higher in the stem of the plus- than the minus-iron cultures. Differences in total hemicelluloses were slight between the plus- and minus-iron cultures. The amounts of both celluloses and lignin were affected only slightly by the different treatments and behaved in this respect like the hemicelluloses.

Studies of the shade requirements of vanilla, E. H. MEDINA. (P. R. Fed. Expt. Sta.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1943), No. 1, pp. 27–37, illus. 5; Span. abs., p. 37*).—When vanilla was grown under four exposures to light it was found that the best vine growth from the standpoint of root germination, seed-piece decay, and vegetative growth was accomplished under changing conditions which admitted from one-third to one-half the normal sunlight when the sun was directly overhead. The most vigorous and greatest weight of vines and the greatest number of eight-node cuttings were attained also under these conditions.

A basin method of nut tree culture, J. M. AIKMAN and C. C. LOUNSBERRY. (Iowa Expt. Sta. and U. S. D. A.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 241–246, illus. 2*).—Nut tree culture in Iowa is confined almost entirely to selected and grafted varieties of black walnut. Experiments in progress since 1938 indicate that such trees can be successfully established on plowed contour strips on eroded Lindley loam of moderate to steep slope. For the many areas unsuitable for contouring which require other methods of culture the basin method here described—applicable to a unit as small as one tree—appears to be suitable. By this method, each basin is made at right angles to the slope by scalping the sod from the basin area and using it to sod the lower rim of the area. By "staggering" the arrangement on the slope, a given basin is located below the space between two basins in the row above so that no perceptible quantity of water is lost from the slope. The detailed procedure is outlined; its results would seem to indicate that grafted walnuts can be established with a good chance of success in southeastern Iowa in eroded forest soil on slopes too steep and badly eroded for clean cultivation.

Mycorhizas of filbert and walnut trees in Oregon orchards, C. E. SCHUSTER, R. E. STEPHENSON, and W. EVENDEN. (Oreg. Expt. Sta. coop. U. S. D. A.). (*Bot. Gaz., 105 (1944), No. 3, pp. 388–392, illus. 4*).—In this survey of the presence and distribution of mycorhizas, several hundred root samples were taken at random from 9 filbert and 12 Persian walnut orchards—the latter on *Juglans hindsii* rootstocks—representative of most of the soil types on which these trees are grown in the Willamette Valley, Oreg. Ectotrophic mycorhizas were so generally present on filberts that their effects on root development could not be determined under orchard conditions; such mycorhizas have not been found on walnut. The effects on root growth of ectotrophic forms on filbert and endotrophic forms on walnut were similar in that terminal root growths were shortened and laterals clubbed and shortened. Regardless of soil type or amount of available P, soluble K or Ca, organic matter, or soil pH, mycorhizas were always present on filbert and walnut roots. Since mycorhizas have been found on the native hazel *Corylus californica* and since practically all the walnut rootstock material consisted of seedlings grown in the Willamette Valley from local or California-produced nuts, it is believed that the same or related species of mycorhizal fungi are indigenous. In the field, there was no evidence that in the deep fertile soils mycorhizas were either necessary or detrimental or that on weak devitalized trees growing on shallow infertile soils they either hastened or otherwise promoted the decline of the trees.

Effects of harvest date and curing on the composition and palatability of pecan nuts, C. L. Smith and A J. Loustalot. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 11, pp. 395–403*).—In pecan nuts of the Success and Western varieties harvested at early, medium, and late stages of maturity and cured at room temperature, at 0°–2° C., at 35°, and at 50°, total sugars increased greatly in kernels from early to late harvest dates, increased considerably during curing in kernels of nuts from early or midseason harvest, the greatest increase occurring in kernels of nuts cured at room temperature, while the least increase occurred in those cured at 0°–2° and at 50°. Acid-hydrolyzable polysaccharides decreased in kernels during and part of these were probably converted to sugars. The shucks lost a considerable amount of reducing sugars during curing, while acid-hydrolyzable polysaccharides increased. The amount of oil per kernel increased from early to midseason harvest dates. Organic nitrogen increased in kernels of the Success variety from early to late harvest dates but not in the Western variety, indicating that protein formation may occur later in the Success than in the Western. No important changes in composition of shells occurred from early to late harvest dates or during curing in either variety. Kernels of nuts cured at 50° were brittle, and the flavor was impaired in that they tested like partially roasted kernels. This was true of all nuts cured at 50° regardless of date of harvest. Kernels of nuts cured at 0°–2° lacked sweetness, the texture was flabby and tough, and the color was lighter than that of nuts cured at higher temperatures.

Papers presented at ninth annual convention of American Tung Oil Association at Bogalusa, Louisiana, April 30–May 1, 1943 (*Amer. Tung Oil Assoc. Ann. Conv., Bogalusa, La., Papers, 9 (1943), pp. 77+*).—The following are included: A Preliminary Report on Seedling Progenies of Tung, by E. Angelo (pp. 1–4), Tung Trees of Vase Form Prove More Productive in Early Years Than the Natural Head Type, by J. H. Painter and M. S. Neff (pp. 5–8), The Effect of Length of Root, Size of Top, and Watering at Planting on the Growth of *Aleurites fordii* Hemsl., by J. Hamilton (pp. 9–13), Effect of Nitrogen on Blossom Formation in Bearing Tung Trees, by G. F. Potter, W. W. Kilby, and G. M. Bahrt (pp. 14–18), Mulching, a Valuable Treatment for Young Tung Trees in Potassium Deficient Soil, by J. H. Painter and R. W. Jones (pp. 19–23), Experiments on the Control of Thread Blight in Tung Orchards, by J. R. Large (pp. 24–29), Fertilizing Tung With Elements Other Than Nitrogen, Phosphorus, and Potassium, by G. M. Bahrt and W. W. Kilby (pp. 30–33), Root-Knot of Tung and Its Control, by J. R. Large (pp. 34–37), Effect of Fertilizers on Oil Content of Tung Fruits, by G. F. Potter, W. W. Kilby, G. M. Bahrt, A. F. Freeman, F. C. Pack, and R. S. McKinney (pp. 38–49), Potassium Deficiency of Tung, by M. Drosdoff, J. H. Painter, H. M. Sell, and S. G. Gilbert (pp. 50–53), and Solvents in the Extraction of Tung Oil, by A. F. Freeman, F. C. Pack, and R. S. McKinney (pp. 57–61) (all U. S. D. A.), Copper Deficiency of Tung, by M. Drosdoff and R. D. Dickey (pp. 54–56) (U. S. D. A. and Fla. Expt. Sta.), and Some Problems of Interest to Tung Producers, by R. S. McKinney, W. G. Rose, and A. B. Kennedy (pp. 62–77) (U. S. D. A. et al.).

The influence of stratification of tung-seeds upon emergence and establishment of seedlings in the nursery, L.-Y. Li (*New Zeal. Jour. Sci. and Technol., 25 (1943), No. 1, Sect. A, pp. 43–48, illus. 3*).—In field tests of (1) nonstratified seeds and of (2) stratified seeds stored in moist sphagnum at 40°–60°, 38°, and 32° F., the second group started and completed their emergence earlier, 75 to over 95 percent emerging within 3 weeks after the first individuals started. Stratification also increased the number of established seedlings. Although seeds stratified at 40°–60° gave a satisfactory emergence and establishment of seedlings, those held at 38° and 32° emerged slightly sooner and gave a somewhat better final establish-

ment of seedlings; no significant difference was noted in the emergence of seeds and establishment of seedlings between the two lower temperatures.

Novas contribuições para o conhecimento das seringueiras ("Hevea") da Amazônia Brasileira [New contributions to the knowledge of the Heveas of the Brazilian Amazon], A. DUCKE (*Arq. Serv. Florest., 2 (1943), No. 1, pp. 25–43*).—Main consideration is devoted to the species, varieties, and forms of *Hevea*, their commercial value, and natural hybrids among the species.

FORESTRY

Range research of the United States Forest Service, R. S. CAMPBELL. (U. S. D. A.). (*Chron. Bot., 7 (1943), No. 8, pp. 381–383, illus. 1*).—A brief historical summary of range research by the U. S. Department of Agriculture, beginning with the studies of the Forest Service under J. T. Jardine, in cooperation with the Bureau of Plant Industry, under F. V. Coville, and some of the State experiment stations, and taking it through to the present war emergency investigations.

Plant succession on burned chaparral lands in northern California, A. W. SAMPSON (*California Sta. Bul. 685 (1944), pp. 144, illus. 47*).—The foothills of California are extensively used for the grazing of domestic livestock, but this industry is handicapped by the presence of aggressive species of sclerophyll scrub, called "chaparral." The brush-fields do furnish some forage for stock, and they are also valuable in watershed protection, as ground for game, and limitedly for recreation. Burning and overgrazing has resulted in widening the chaparral belt in some localities, chiefly because of the strong sprouting habits of the most abundant species and the fact that fire stimulates seed germination. Although burning of productive brushlands usually results in increased forage for some three seasons, the chaparral soon becomes denser than before the fire. Burning and grazing of steep slopes is usually accompanied by accelerated erosion. Gently sloping lands of deep soils can be profitably cleared by girdling, chopping, or by using power machinery. A bibliography of 117 references is included.

Apparent photosynthesis in some conifers during winter, R. O. FREELAND (*Plant Physiol., 19 (1944), No. 2, pp. 179–185*).—Field experiments on the apparent photosynthesis of *Picea mariana, Pinus sylvestris,* and *P. nigra austriaca* indicated that they do not lose their photosynthetic capacity during midwinter. Apparent photosynthesis may be positive at air temperatures above approximately —6° C.; respiration appears to occur at even lower temperatures.

Relation between light intensity and rate of photosynthesis of loblolly pine and certain hardwoods, P. J. KRAMER and J. P. DECKER (*Plant Physiol., 19 (1944), No. 2, pp. 350–358, illus. 2*).—Photosynthetic rates for *Pinus taeda, Quercus borealis maxima, Q. alba,* and *Cornus florida* were determined for 1-hr. periods at approximately 30° C. with various light intensities from 300 up to nearly 10,000 footcandles. Photosynthesis in loblolly pine increased with light intensity up to the highest used—almost that of the sun; in the three hardwood species its maximum was reached at one-third or less of full sunlight and exhibited slight but statistically significant decreases at higher intensities. These findings indicate that lack of sufficient light for maximum photosynthesis may be an important factor in the failure of pine seedlings to become established under forest stands; they are believed unable to manufacture enough food in the shade to develop sufficiently extensive root systems for absorbing adequate water during periods of drought. Seedlings of certain hardwood species, on the other hand, are able to carry on relatively more photosynthesis in the shade and therefore can develop more extensive root systems, probably thus enabling them to survive droughts proving fatal to pine seedlings.

Effect of nitrogen on growth and drouth resistance of jack pine seedlings, D. W. Bensend (*Minnesota Sta. Tech. Bul. 163 (1943), pp. 63, illus. 20*).—Jack pine, because of its ready response to nutrients and its increasing importance in the Lake States, was selected for study. The height and weight of the seedling stems increased with an increase in the supply of N up to 200–250 p. p. m. Beyond this point there was a decrease in both weight and height. The weight of the roots increased up to 100 p. p. m. of N, with further increments causing little change. The root : shoot ratio decreased with an increase in available N until a supply of 100 p. p. m. was reached, after which there was little or no change. The percentage of N in the stems and roots increased with an increase in the supply of N. The percentage of N in the seedlings (average for roots and stems) for the optimum N supply was approximately 2.2 percent for both sand cultures and nursery soil. Seedlings grown under an optimum N supply were as drought resistant as those grown in soils deficient in N. An increase in the N supply above the optimum decreased drought resistance. The results of the experiment suggest that jack pine stock that had been grown in soil with a favorable N supply will have an N content of 2.25 ± 0.2 percent. This conclusion applies to both 1- and 2-year-old stock.

The garry oak in British Columbia: An interesting example of discontinuous distribution, R. Glendenning (*Canad. Field Nat., 58 (1944), No. 2, pp. 61–65, illus. 1*).—On *Quercus garryana.*

Systematic anatomy of the woods of the Tiliaceae, F. Kukachka and L. W. Rees (*Minnesota Sta. Tech. Bul. 158 (1943), pp. 70*).—Anatomical studies of 578 specimens, representing 206 species and 37 genera, revealed a marked similarity in the structure of the secondary xylem of a great majority of the genera studied, and a decided diversity in the anatomy of the others. The study supports the system of Engler and Prantl in segregating the Elaeocarpaceae from the Tiliaceae as well as the disposition of the genera and tribes in the former family. The family Tiliaceae comprises at least nine distinct groups on the basis of wood structure, and these groups most nearly approximate the tribes as proposed by Burret. The shrubby members of the family appear to be more primitive than the tree forms. In general, the evolution of the floral structure seems to be correlated with the evolutionary development of anatomical structures. The authors believe the anatomical studies to be of great value in the establishment of a natural classification of the angiosperms. There are 107 literature citations.

DISEASES OF PLANTS

Plant disease surveys in the northeastern United States in 1943 (*U. S. Dept. Agr., Plant Disease Rptr., 1944, Sup. 147, pp. 123–229*).—Supplements 147 to 149 are to report the results of surveys conducted by members of the Emergency Plant Disease Prevention Project of the Bureau of Plant Industry, Soils, and Agricultural Engineering and divided into three parts on a roughly geographical basis. This, the first, includes the area north of the Ohio and Potomac Rivers, west to Minnesota and Iowa. In all cases the surveys were planned under the supervision of the collaborators and other pathologists in the States concerned and made with assistance from them as well as from county agents and numerous others.

The Plant Disease Reporter, [April 15 and 22 and May 1 and 7, 1944] (*U. S. Dept. Agr., Plant Disease Rptr., 28 (1944), Nos. 9, pp. 327–353, illus. 2; 10, pp. 355–363, illus. 1; 11, pp. 365–416; 12, pp. 417–436*).—The following are included:

No. 9.—Phytophthora canker of madrone (*Arbutus menziesii*) in California, by W. W. Wagener and M. S. Cave; a study of fungi parasitic on Ohio seed corn, by M. R. Harris; reports on disease of cereal crops (S. C., Ga., Tex., Calif.); alfalfa crown rot in Kentucky, stem blight of Austrian Winter peas in Georgia, and forage

crop diseases in South Carolina; nematode survey in Georgia, by A. L. Taylor; distribution of the meadow nematode in Virginia—I, on boxwood, and a survey of vegetable plants in West Virginia greenhouses, both by C. F. Taylor; vegetable diseases in greenhouse and hot and cold beds in Kentucky; diseases in Colorado greenhouses and hotbeds; reports on late blight and other diseases of potato, tomato, and peppers (S. C., Fla., La.); vegetable diseases in South Carolina; diseases of peas and beans in Georgia; lettuce and escarole diseases in southern Florida; vegetable diseases in southern Louisiana; onion and spinach diseases in the coastal bend area of Texas; lettuce diseases in the Yuma Valley, Yuma, Ariz.; vegetable diseases in central California; diseases of fruits and vegetables observed on the Boston (Mass.) market, by R. C. Cassell; reports of potato storage diseases (Vt., W. Va., Colo.); development of the apple scab fungus in the Hudson Valley, N. Y.; sporulation of apple-cedar rust in West Virginia; greenhouse diseases of ornamentals in West Virginia; rose diseases in the coastal bend area of Texas; diseases of ornamentals in Colorado greenhouses; and brief notes on *Phytophthora megasperma* root rot of spinach in North Carolina and condition of cotton in the coastal bend area of Texas.

No. 10.—Wound dressing for London plane trees, by J. M. Walter; the distribution of milo disease (*Pythium arrhenomanes* and other factors) in central and western Kansas as determined by soil samples, by S. M. Pady; sweetpotato storage diseases in Georgia, by J. H. Miller and G. Thompson; sweetpotato storage disease in Iowa, by E. F. Vestal; potato late blight in southern Florida; bacterial ring rot in potato seed sources used in Colorado; condition of tomato plants in Colorado; celery mosaic in southern Florida; onion storage diseases in Colorado; diseases of peas in central California; *Septoria rubi* found in South Carolina, Georgia, and Louisiana, by D. P. Limber; and brief note on crown gall on nursery stock received in Colorado.

No. 11.—A preliminary list of authors of names of plant parasites with recommended abbreviations, by J. A. Stevenson; root rot disease-complexes of tobacco with reference to the meadow nematode—a preliminary report, by W. A. Jenkins; tobacco downy mildew in the Carolinas, by R. E. Atkinson; late blight of potatoes from "healthy" tubers, by W. D. Thomas, Jr.; late blight and other diseases of potato in southern Louisiana and Mississippi, by D. C. Bain; potato late blight in South Carolina, Georgia, and the Lower Rio Grande Valley of Texas; nematodes on potatoes in the Hastings section of Florida, by A. L. Taylor; condition of seed potatoes in Massachusetts, by R. C. Cassell; condition of government-stored Maine potatoes in Providence, R. I.; decay of squash in storage and transit in Washington; occurrence of crown necrosis in lettuce, by H. L. Barnett and W. C. Snyder; reports on diseases of vegetable crops, including greenhouse crops in eastern Massachusetts, diseases in Long Island and Staten Island cold frames, condition of cucumbers in Ohio greenhouses, lettuce diseases in North Carolina and Georgia; downy mildew of onions in Georgia, diseases of onions and shallots in southern Louisiana, condition of pimento pepper plant beds in Georgia, tomato plant situation in Georgia, tomato virus disease in an Ohio greenhouse, and leaf spot of turnip greens in Georgia; year-around occurrence of stem rust of wheat (*Puccinia graminis tritici*) in California, by C. A. Suneson; weather, crop, and cereal disease conditions in Kansas, by C. O. Johnston; and reports on diseases of cereal crops, including wheat and forage crops in Ohio, sclerotial disease of wheat in Missouri, snow scald of wheat in central Washington, black stem rust in the Palouse (Wash.) in 1943, and observations on flax in the Yuma Valley of Arizona.

No. 12.—Wheat mosaic survey in Illinois and Missouri, and notes on other wheat diseases, by T. W. Bretz; condition of winter wheat in New York, by L. J. Tyler; other reports on diseases of cereal crops (Va., Miss., Tex.); diseases reported on

leguminous forage and cover crops (Va., W. Va., Ky., Tenn., Miss., La., Ohio, Idaho, Oreg.); diseases in tobacco seedbeds in Tennessee, by R. A. Hyre; stone fruit diseases in central California, by H. L. Barnett; apple scab in New York and Ohio; pear leaf spot in Mississippi; diseases of peach trees in east Texas; *Coryneum* blight of stone fruits in the Snake River Valley; very few citurus diseases observed on the Yuma Mesa of Arizona; diseases of cane fruits in east Texas; strawberry diseases in Virginia and Ohio; condition of seed potatoes in the Connecticut River Valley of Massachusetts and Connecticut, by R. C. Cassell; potato storage diseases in Idaho, by E. C. Blodgett; nematode survey in Georgia, by A. L. Taylor; outbreak of potato late blight in Louisiana, by D. C. Bain; reports on diseases of potato (Va., Tex., Colo.) and tomato (Va., Miss., Tex., Colo.); and other reports on diseases of vegetable crops—bean mosaic (Miss., La.), diseases of cabbage and kale (Va.), onion diseases (Tex., Colo., Idaho), powdery mildew on peas (La.), spinach diseases (Va., Tex.); *Phytophthora* root rot of spinach (Calif.), and rootknot (Va.).

A preliminary list of plant diseases in Jamaica, L. N. H. Larter and E. B. Martyn (*Imp. Mycol. Inst., Mycol. Papers No. 8 (1943), pp. 16+*).—An annotated list arranged by common names of economic plants, with index of Latin names and list of 36 references.

The isolation of viruses by means of the electrically driven Sharples supercentrifuge, R. Markham (*Parasitology, 35 (1944), No. 4, pp. 173–177, illus. 1*).—The technic of using this supercentrifuge is described, the theory of sedimentation in such centrifuges is discussed, and curves of the theoretical sedimentation rates are given. The probability that convectionless sedimentation cannot occur in high-speed preparative centrifuges is also discussed in relation to the theory of "differential centrifugation."

Bacteriostatic and bactericidal properties of antibiotic substances, with special reference to plant-pathogenic bacteria, S. A. Waksman, E. Bugie, and H. C. Reilly. (N. J. Expt. Stas.). (*Bul. Torrey Bot. Club, 71 (1944), No. 2, pp. 107–121*).—Plant-pathogenic bacteria were found not to vary greatly in sensitivity to antibiotic substances from other bacteria. Greater differences occurred among species than among the sources from which they had been isolated or their functions under natural conditions. Some substances—notably actinomycin and penicillin—acted largely against gram-positive bacteria. Sensitivity to actinomycin ranged from the spore-forming aerobic bacteria and cocci on the sensitive to *Escherichia, Aerobacter,* and *Serratia* on the resistant side. Penicillin, however, failed to show exactly the same gradation in sensitivity, some gram-negative bacteria like *Neisseria* being sensitive and some gram-positive bacteria like *Bacillus mycoides* being resistant. Some substances, like streptothricin and clavacin, acted alike on both gram-negative and gram-positive bacteria but also revealed certain differences, the first being much more selective against the various bacteria than the second. Some gram-positive (*B. mycoides*) and gram-negative (*Pseudomonas aeruginosa*) bacteria were very resistant to streptothricin and others very sensitive (*B. subtilis* and *Brucella abortus*).

Two other antibiotic substances—fumigacin and chaetomin—showed an activity intermediate between that of the two other groups of compounds; though largely active against gram-positive bacteria and only to a very limited extent against the *E. coli* group, they were also active against certain gram-negative organisms, especially of the plant-pathogenic types. The degree of sensitivity of bacteria to the various antibiotic substances, therefore, can be only roughly based on their staining reactions; the gram stain is not the absolute determinant of the sensitivity of bacterial resistance. When more than one substance is tested, it is found that the different bacterial species exhibit distinctly different antibiotic spectra; this points to greater physiological differences among bacteria than can be explained by mere

differences in staining reaction. No attempt is here made to interpret the significance of these results in terms of possible plant disease control; the fact, however, that the microorganisms from which the antibiotic substances were isolated are normal soil inhabitants makes these findings highly suggestive.

The action of calcium cyanide as a soil disinfectant, R. K. Tam and H. E. Clark. (Pineapple Res. Inst. Hawaii). (*Soil Sci., 57 (1944), No. 5, pp. 359–365, illus. 3*).—When commercial calcium cyanide (Cyanogas) was applied to Hawaiian lateritic soil of pH 4.4 at the rate of 80 p. p. m. of N under abundant moisture conditions and with a mulch-paper cover, 81 percent of the N therein was recovered as NH_4 in the soil 26 weeks after application. This elimination of the nitrifying organisms was in contrast to the nearly complete nitrification of added $(NH_4)_2SO_4$ in nondisinfected soil. The cyanide had relatively little effect on fungus and actinomycete populations; only bacteria showed a limited increase in numbers after the treatment.

The life-history of an organism causing hypertrophy of the leaf bases of Triglochin maritimum, W. R. I. Cook and B. Cleal (*Ann. Bot. [London], n. ser., 7 (1943), No. 28, pp. 347–355, illus. 19*).—Material of a member of the Plasmodiophoraceae was found in southern England causing the leaf bases of shore podgrass to swell, thereby producing oval galls up to 3 cm. long. The fungus is considered identical with the incompletely described *Tetramyxa triglochinis* Moll. and is here transferred to *Plasmodiophora triglochinis* n. comb.

A new chytrid parasitizing Volvox: Loborhiza metzneri gen. nov., sp. nov., A. M. Hanson (*Amer. Jour. Bot., 31 (1944), No. 3, pp. 166–171, illus. 31*).—This new chytrid fungus—apparently specific in its host relations—was found parasitizing all but the purely vegetative cells and thick-walled zygotes of the alga *V. carteri.*

Manganese deficiency in soils and crops.—II, The use of various compounds to control manganese deficiency in oats, J. D. MacLachlan (*Sci. Agr., 24 (1943), No. 2, pp. 86–94, illus. 1*).—Very heavy soil applications of preparations containing $MnSO_4$ were required to correct the deficiency in Erban oats. Addition of S at the rate of 1,000 lb. per acre increased the yield materially and in one case reduced by about two-thirds the amount of Mn necessary. Of the sprays tested, a single 2 percent spray of $MnSO_4$ or one of Tecmangam (67 percent $MnSO_4$), with a spreader and sticker added, resulted in the highest yield but with some foliage burning. The spray failed to give as high a yield as the heavy soil applications, but this lower yield was more than counterbalanced by the added cost of materials for soil use. Foliage dusting with $MnSO_4$ and Tecmangam without a diluent caused severe leaf burning. Three Mn ores tested as soil applications at 250 lb. per acre or as foliage dusts equivalent in Mn content to 1 percent $MnSO_4$ spray gave little or no response. Soil applications of Tecmangam at rates of 68–619 lb. per acre were made on a large muck field where oats had normally expressed mild to moderate signs of Mn deficiency and successive cuts were made for processing into powdered oats grass. Mild signs of deficiency were evident on the control plats at the time of the first cutting, just prior to jointing. Both yield and Mn content of the powdered grass indicated a response directly proportional to the amount of Tecmangam added. No signs of Mn deficiency were evident on the controls at the time of the second cutting, 17 days later. The Mn content of the powdered grass indicated a response to the Tecmangam, but no definite correlations could be made here with respect to yield. The preceding paper of the series dealt primarily with the role of soil micro-organisms in rendering Mn unavailable.[1]

Studies on the biology of Erysiphe graminis DC., W. J. Cherewick (*Canad. Jour. Res., 22 (1944), No. 2, Sect. C, pp. 52–86, illus. 7*).—*E. graminis,* cause of

[1]Sci. Agr., 22 (1941), No. 3, pp. 201-207, illus. 6.

powdery mildew of cereals and grasses, occurs in every Canadian province but is more prevalent in British Columbia and the five eastern provinces. The evidence indicates that it overwinters as mycelial mats on dead straw and as mycelial infections on overwintering hosts. Three new physiologic races of barley mildew were identified, making a total of seven isolated in Canada, but only race 1 of wheat mildew was found. A study of the stability of six barley races indicated them to be distinct biologic entities comparable to the physiologic races in cereal rusts. No evidence was obtained by cross inoculations that any variety of *E. graminis,* except possibly *agropyri,* can attack a nonsuscept or an immune variety of its host or that injury of such hosts renders them susceptible. Conidia germinated on immune hosts and penetration proceeded as far as the papilla stage. Physiologic resistance is manifested in some hosts by the death of infected cells and in others by distortion of the haustoria. The evidence indicates the fungus to be homothallic. The cardinal temperatures for conidial germination are 0°, 10°, and 35° C., but the best development of mildew occurs at 15°–20°. Alternating temperatures induce perithecial development. Except indirectly, light is not an important factor in the development of the fungus. Alternate drying and wetting of perithecia proved necessary for ascospore formation, but other stages were favored by relatively dry conditions. Conidia germinated well even at zero humidity. Sprinkling infected seedlings with water checked the development of the disease. Soil applications of certain fertilizers and other chemicals commonly claimed to increase host resistance to powdery mildew failed to do so for susceptible seedlings of wheat and barley. There are 73 references.

Influence of light on the infection of wheat by the powdery mildew, Erysiphe graminis tritici, R. Pratt (*Bul. Torrey Bot. Club, 71 (1944), No. 2, pp. 134–143, illus. 2*).—Infection by *E. graminis' tritici* occurred when wheat plants were illuminated for as little as 1 hr. each day, although the virulence of the infection was somewhat reduced; a 3-hr. daily illumination permitted heavy infection. In total darkness, the spores germinated and the young mycelia penetrated the host tissue, but the fungus died before sufficient growth had occurred for it to become macroscopically visible. Blue light (wavelength 436μ with an intensity of 6.2 ergs/mm.^{2}/sec. exerted no effect on spore germination, but all other regions of the spectrum studied at a similar energy value seemed to cause an appreciable reduction in percentage of those germinating in tap water. The spores proved highly sensitive to ultraviolet irradiation from a quartz mercury arc, and their sensitivity increased as they became more hydrated.

An estimate of loss in Manitoba from common root rot in wheat, J. E. Machacek (*Sci. Agr., 24 (1943), No. 2, pp. 70–77*).—Common root rot of cereals and grasses—due chiefly to *Helminthosporium sativum* and *Fusarium culmorum*—is widespread in Manitoba, during 1930–41 no wheatfield in the Province being found free from the disease. The average percentages of affected plants and of reduction in yield for 1939–41 were estimated at 38.3 and 12.1, respectively. An average for the 3 yr. showed that a slight attack reduced the yield of individual plants by 25.7 percent, a moderate attack by 37.5 percent, and a severe attack by 53.3 percent. Yields were reduced by decreases in the numbers of fruiting tillers and of kernels per spike. Because the proportion of slightly diseased plants was usually high, most of the loss occurred in this class. The severity of the trouble in any one year varied greatly from soil zone to soil zone, but there was no tendency during the 3 yr. for severe forms to be confined to any one soil zone.

On an epidemic of Gibberella saubinetii (Mont.) Sacc. on wheat in Eire in 1942, R. McKay (*Roy. Dublin Soc., Sci. Proc., n. ser., 23 (1943), No. 11, pp. 111–129, illus. 11*).—This epidemic of scab appeared during the flowering period and in some cases was so severe that many wheat heads formed no fully developed

grains. Reductions in yield in three different localities were of the order of 21, 38, and 55 percent, respectively; these figures, however, fail to represent the total loss, as much of the remainder of the crop consisted of shriveled grain of low germinability. The epidemic was associated with showery weather beginning early in July and with climatic conditions becoming worse as the season advanced. Perithecia developed freely on several wheat varieties and were recorded from 10 counties; it is believed that moisture rather than temperature was the main factor in their development. Perithecia were also found on two oats varieties—apparently the first record of their spontaneous occurrence in Eire. Some evidence is presented that the disease has been endemic in certain districts for a considerable time.

Methods of appraising intensity and destructiveness of cereal rusts, with particular reference to Russian work on wheat leaf rust, K. S. CHESTER. (Okla. Expt. Sta.). (*U. S. Dept. Agr., Plant Disease Rptr., 1944, Sup. 146, pp. 99–121+, illus. 3*).—This is a comprehensive summary and discussion of methods (43 references) of determining the intensity of and estimating the losses from the cereal rusts. Much of the material included is not readily available to American workers, particularly the important results of such investigations in Russia. An appendix presents an annotated list of examples of wheat losses from rust—particularly *Puccinia triticina*—in Russia.

Identification of physiologic races of Puccinia graminis tritici, E. C. STAKMAN, M. N. LEVINE, and W. Q. LOEGERING. (Coop. Minn. Expt. Sta.). (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1944, E-617, pp. 26, illus. 1*).—The last key for identifying physiologic races of *P. graminis tritici* was issued January 1, 1938, listing 162 races; the present key includes 189 as of January 1, 1944. This list could easily be expanded to more than 200 if minor but consistent characters were used for differentiating the races. Introductory to the keys and tables, the authors discuss the concept of races and biotypes, the differential varieties, and procedures for collecting and preserving samples and using the keys and tables provided.

Untersuchungen über die Fusskrankheit der Ackerbohne [Studies of foot rot of broadbean], H. SCHULTZ (*Zentbl. Bakt. [etc.], 2. Abt., 106 (1943), No. 1–4, pp. 38–50, illus. 11*).—*Fusarium* spp. are mentioned principally in the literature (17 references) as causes of foot rot of *Vicia faba,* though some authors include also *Pythium* and *Rhizoctonia.* The symptoms, economic significance, and distribution of the disease complex are summarized. In both greenhouse and field, the pathogenicity to broadbeans of numerous strains of *R. solani, P. debaryanum, P. ultimum, P. irregulare,* and *F. avenaceum* was tested by inoculation. The results indicated that many strains of *Rhizoctonia* and *Fusarium* are capable of severely injuring this host, whereas Pythiums used were, with few exceptions, only weakly pathogenic.

Pea diseases in Idaho, G. KENKNIGHT (*Idaho Sta. Bul. 253 (1944), pp. 13, illus. 7*).—This informatory bulletin considers the diseases that may cause serious yield losses, those that may reduce the value of seed, and minor diseases, including control measures.

Pea mosaic on Lupinus varius L. and other species in Western Australia, D. O. NORRIS (*Austral. Council Sci. and Indus. Res. Bul. 170 (1943), pp. 27, illus. 4*).—Descriptions are given of the symptoms on five species of *Lupinus* by the pea mosaic virus; on *L. varius* they were unusual, the plants entering on a secondary phase of growth after infection. An inhibition of infection of peas by inoculation with sap of *L. varius* is described and discussed. Seed transmission was not found to occur in *Lupinus* or subterranean clover but is suspected of playing an important role in the oversummering of the virus in peas. Transmission to *Lupinus* is mainly from peas, broadbeans, and sweet peas. The shrub *Cassia corymbosa* is recorded for the first time as a perennial host, enabling the virus to survive the dry

summer. Aphids of nine species are shown capable of acting as vectors, the most common one in Western Australia being the green peach aphid. The relative susceptibility of the five lupines studied is discussed and related to the effects of alkaloid content on the palatability to aphid vectors. *L. luteus* (sweet variety) appears to possess considerable resistance. The disease is believed to be of little economic significance.

Which varieties of peas need treatment? G. L. McNew (*Canner, 98 (1944), No. 19, pp. 14, 16, 26, 28, 30, illus. 2*).—Some of the misconceptions on the need of seed treatment for different varieties are believed cleared up by the field tests here reported upon. All of the sweet varieties are undoubtedly susceptible to attack by seed decay fungi, and emergence was consistently improved by seed treatment of all of those tested. Much of the confusion about the need for treatment is considered to have originated because of limited observation on a single seed stock. The reason for the varying behavior of stock within a variety is not immediately obvious; it might be due to an inherent weakness or susceptibility to seed decay, but a more likely explanation is believed to be that small differences in vitality are responsible. The Alaska type of seed presents a baffling problem; occasionally poor stands are reported but they are infrequent. There is reason to believe, however, that seed treatment of this group would also be a wise practice. Detailed recommendations for 1944 seed treatments with Spergon, Semesan, and Red Cuprocide are presented. In case these materials should be short in supply, the new organic sulfur preparations Arasan and Fermate are suggested; though they have not yet been thoroughly tested out, they have shown promise on the few varieties where applied.

Pea seed treatments as crop insurance, G. L. McNew (*Canner, 98 (1944), No. 20, pp. 20–22, 46, 48, 50, illus. 3*).—On the basis of detailed experimental data presented relative to differences in seed stocks and in soil temperature and moisture, it is recommended that pea seed be treated every year because it is almost impossible to judge when weather conditions will favor seed decay; even the strongest seed may be destroyed, and there is no variety that will escape injury under all conditions. Two benefits from seed treatment are cited, viz, prevention of stand failures or near failures and increased vigor and productiveness of plants. The evidence indicated that there is no substitute for good seed; treatment will help all types, but the greatest benefits are secured from treating strong stocks. Some seed with fairly high germinability may be low in vitality and hence a poor risk in ordinary fields where fungi of decay attack them so readily.

Der Brand der Rispenhirse (Sphacelotheca panici miliacei) und seine Bekämpfung [Smut of broomcorn millet and its control], H. Richter and H. Müller (*Zentbl. Bakt. [etc.], 2. Abt., 106 (1943), No. 1–4, pp. 32–37, illus. 3*).—On the basis of the literature (32 references), the author summarizes recent information on the symptoms, geographical distribution, economic significance, and control of the disease. Seed treatment tests have shown it to be controllable by the mercurial disinfectants Abavit, Ceresan, Germisan, and Fusariol.

Sorghum seed treatment, W. F. Buchholtz (*South Dakota Sta. Cir. 51 (1944), pp. 8, illus. 2*).—As based on experimental work, it was found that covering the seed with a mold-killing dust before planting completely controls smut, prevents seed decay by molds in cold wet soil, and kills molds on the seed. This circular shows how it is done.

Sweetpotato diseases, L. L. Harter (*U. S. Dept. Agr., Farmers' Bul. 1059, rev. (1944), pp. 26+, illus. 20*).—This revision (E. S. R., 42, p. 48) is an informatory account of the field diseases and storage rots and their control, with sections on digging and handling the roots and on the storage house and its management.

Diseases of tobacco in 1943, P. J. Anderson (*Connecticut [New Haven] Sta. Bul. 478 (1944), pp. 105–110*).—Seasonal field observations are presented on wildfire, frenching in seedbeds, and mosaic, and a summary of control experiments with Fermate against damping-off and downy mildew and salicylates and paradichlorobenzene for downy mildew.

Tobacco leafspot bacteria on roots of pasture plants, W. D. Valleau, E. M. Johnson, and S. Diachun. (Ky. Expt. Sta.). (*Jour. Bact., 47 (1944), No. 2, p. 214*).

Angular leafspot and wildfire of tobacco, W. D. Valleau, E. M. Johnson, and S. Diachun (*Kentucky Sta. Bul. 454 (1943), pp. 60, illus. 13*).—The report here made represents a summary of the results of studies carried on over a 20-yr. period in an attempt to obtain a clearer understanding of these diseases and to find methods of prevention. *Bacterium angulatum* (angular leaf spot) and *B. tabacum* (wildfire) die out rather rapidly in potato-dextrose (2 percent) agar, death being preceded by an increase in H-ion concentration. By reducing the dextrose content or by adding KOH or $CaCO_3$ to the medium, longevity is greatly increased. Beef-peptone broth or agar are suited to storage, since the pH remains near 7. Colonies derived from a pure culture are uniform in type on agar plates, but great differences occur among strains. The virulence of strains of each organism ranges from faintly pathogenic to those producing typical spots. The two species are closely related, *B. tabacum* appearing to be a chlorolytic strain of *B. angulatum*; no evidence was found that they are identical with *Pseudomonas fluorescens*. Seed transmission appears to play no part in outbreaks of these diseases. The organisms multiply also in leaves of cowpea, soybean, pepper, groundcherry, morning-glory, tomato, jimsonweed, and bullnettle, as well as on the roots of several crop plants and weeds; they appear to be rather common soil inhabitants, living on the surface of rootlets.

Outbreaks in the bed apparently occur after multiplication has taken place on the roots of tobacco seedlings and when weather conditions are such that the leaves become water-soaked. Wildfire and angular leaf spot can be effectively prevented in the beds by one or two applications of bordeaux to the soil surface when the plants are small. Seedlings free from leaf spot at transplanting may contract either disease after setting in the field; infection can be carried on the roots from treated beds or can originate in the field. Flea beetle injuries on the ground leaves have been found infected with *B. angulatum* in early July. Leaf infection usually occurs through the stomata when the leaves are water-soaked; it also takes place through wounds. Very young leaves are not easily inoculated, but all rapidly developing leaves are susceptible to both species; as the leaves mature they become highly resistant, at which time the "blackfire" spots are most likely to form. As leaves pass the highly susceptible stage, infection occurs less readily through the upper than the lower surface. In the bed, plants are more susceptible when the leaves are 2–4 in. long; as the seedlings get larger and begin to crowd they become highly resistant. In the field, greater injury to the leaf follows infection when the plant is in K-deficient soil. Blackfire frequently appears to be a continuation of an outbreak of wildfire or angular leaf spot or both. The disease occurs at a time when the leaves usually do not respond to infection by pathogenic bacteria. The mechanism by which the blackfire type of spot develops is still unexplained.

Studies on black tobacco.—III, Statistical analysis of a field crop, S. B. Lecompte, Jr. (*Connecticut [New Haven] Sta. Bul. 478 (1944), pp. 114-117*).—Certain data of field A (1940) reported previously (E. S. R., 89, p. 443) are here reexamined statistically. It is emphasized that no single factor should be regarded as the only cause of black tobacco. Though the statistics indicated that this condition increased very significantly with soil aluminum in the first and second pickings, this does not mean that soil Al was necessarily the unique cause of a greater yield

of black-curing leaf. It merely shows that of the three soil constituents measured—Al, Ca, and P—the first varied directly with the percentage of black tobacco; other soil factors not measured may have shown an even more intimate relationship. The effect of P in significantly reducing the amount of black or dark tobacco might appear to be mainly that of a soil amendment, not raising the P level in the leaf on a dry weight basis. All the leaf samples tested had a normal P content, comparable with earlier analyses of Connecticut tobacco; in this sense, then, it is illogical to speak of any leaves of this experiment as P-deficient. However, the total P per average entire plant was probably below normal on untreated plats because of the limited plant development; in this sense, such whole plants were P-deficient. Although the benefit of P to tobacco quality may lie largely in chemical action with Fe, Mn, Al, and other metals among the soil particles, there are believed to be within the plant unknown vital effects of P on leaf quality.

Fusarium wilt, a new stalk disease in Connecticut (*Connecticut* [*New Haven*] *Sta. Bul. 478 (1944), pp. 111–114, illus. 2*).—During the harvesting period, *Fusarium* wilt was found on a few tobacco plants on the experiment station farm—the first record for the State. The disease symptoms and characteristics of the fungus (*F. oxysporum nicotianae*) are described and illustrated. No control method other than breeding and selecting for resistant tobaccos is known, but unless wilt becomes more prevalent in Connecticut it is believed no control efforts are warranted.

Histologic-pathologic effects of boron deficiency, J. C. Walker. (Wis. Expt. Sta.). (*Soil Sci., 57 (1944), No. 1, pp. 51–54*).—In this study of B-deficient garden beet and cabbage plants, the first pathologic effects were physiological and tended to speed up cell division and growth. Cell-wall formation and cell differentiation were concurrently interrupted and necrosis followed. The byproducts released from dead or dying cells may also become factors influencing the growth of surrounding cells. In vascular cambium, as in beet roots, the result is a deficiency in conducting elements which leads to secondary effects on plant growth. In storage tissue, as in cabbage pith, necrosis is accompanied by hyperplasia and hypertrophy as well as abnormal differentiation into various types of thick-walled cells. This histologic study, details of which are given, emphasizes that B deficiency may retard growth without inducing macroscopic symptoms. The differentiation of conducting tissues is first affected, and this in turn must affect mineral absorption and distribution and the efficient use of soil nutrients.

Resistance of cantaloupes to downy mildew and the melon aphid, S. S. Ivanoff. (Tex. Expt. Sta.). (*Jour. Hered., 35 (1944), No. 2, pp. 34–39, illus. 3*).—The cantaloup varieties Smith Perfect, Green Fleshed Rocky Dew, Orange Fleshed Rocky Dew, and Cuban Castillian—all of West Indian origin—have exhibited resistance to both *Pcronoplasmopara cubensis* and the melon aphid under southern Texas conditions. Crosses were made between these varieties and other nonresistant commercial sorts in order to develop a shipping cantaloup of the Hale Best type resistant to downy mildew and aphids. Resistance to both appeared in the F_1 as partly dominant. Highly resistant lines, however, were isolated in later generations which combined disease and insect resistance with desirable shipping and other commercial qualities.

Testing of copper fungicides for control of tomato blight in southwest Virginia, R. G. Henderson (*Virginia Sta. Tech. Bul. 89 (1943), pp. 18, illus. 3*).—The diseases here referred to as "blight" include the foliage infections due to *Septoria lycopersici, Alternaria solani, Phytophthora infestans,* and *Stemphylium solani.* Tests were made (1941–42) on the varieties Earliana (early), Pritchard (medium early), and Marglobe (late), using copper oxide dust and spray, tribasic copper sulfate dust and spray, and bordeaux spray. Bordeaux in every instance delayed the maturity of the fruit, this delay being most pronounced for the later

varieties and only slightly so for Earliana in 1942. Application of fungicides gave a marked increase in percentage of No. 1 fruit in both seasons. The increase in 1941 (dry, August-September), however, averaged only about 10 percent for the three varieties; in 1942 (rainy), the percentages were about 30 for Marglobe, 25 for Pritchard, and only 3–5 for Earliana. It is concluded that the yield and quality of marketable fruit on tomatoes in southwestern Virginia can be greatly increased by 4–6 applications of a copper fungicide; that copper oxide and tribasic copper sulfate applied either as dust or spray give a marked degree of leaf blight control but are not as efficient as bordeaux spray in a rainy season; that bordeaux delays the date of the harvest peak of fruit to a much greater extent than the other two fungicides; and that the control of blight is more difficult on early- than on the later-maturing varieties in a season favorable to disease development.

Economical use of copper in tomato spraying, G. L. McNew (*Canner, 98 (1944), No. 23, pp. 16–18, 28, 30, illus. 3*).—In order to put information on the avoidance of waste in the use of fungicides on a scientific basis with respect to the control of tomato foliage diseases, tests were made on the effects of reduced spray schedules, reduced Cu concentrations, and of sprays v. dusts. The results of these tests and of others made for the sake of economy during pre-war years provide concrete information from which certain rules can be devised for modifying spray practices. The discussion of these modifications centers around the adaptation of spray programs to fit the conditions and leaving off the treatment of fields not needing it, the relative effectiveness of sprays and dusts, reduction in the amount of fungicide in sprays, and the proper use of spray equipment.

[Fruit diseases and their control] (*N. Y. State Hort. Soc. Proc., 89 (1944), pp. 18–34, 192–202*).—The following papers are included: Fruit Diseases in 1943, by W. D. Mills (pp. 18–26) (Cornell Univ.); Apple Scab, Cedar-Apple and Quince Rust, Fruit Russet, and Cherry Leaf-Spot Control in 1943, by J. M. Hamilton and D. H. Palmiter (pp. 27–34) (N. Y. State Expt. Sta. et al.); and The Apple Scab Control Program for the Summer Period, by D. H. Palmiter (p. 192).

Sulfur sprays, A. B. Groves (*Virginia Sta. Bul. 359 (1944), pp. 22, illus. 3*).—This is an informatory manual presenting data on the different types and forms of sulfur fungicides, fractionation methods, product adaptability, elemental sulfurs in the Virginia spray program, and the manner and rate of usage of sulfur sprays. It is considered that lime-sulphur still remains the cheapest and most effective fungicide for use on apples in the State, but from the standpoint of safeness it is surpassed by the elemental sulfurs. The elementary sulfur is universally used as the peach fungicide.

The value of magnesium compounds for the control of magnesium deficiency of apple-trees, E. B. Kidson, H. O. Askew, and E. Chittenden (*New Zeal. Jour. Sci. and Technol., 25 (1943), No. 1, Sect. A, pp. 31–42, illus. 4*).—In further studies of this trouble (E. S. R., 86, p. 331), compounds of Mg supplying about 500 or 1,000 gm. of MgO per tree, applied as a top dressing in the winter, produced a gradual improvement during the three following seasons, the effectiveness varying with the variety and soil type, and probably also with previous fertilization. Though none of the experimental trees had by then reached a normal Mg status, the disease in one block of the Sturmer variety was so reduced as to be no longer of practical significance; for other varieties the improvement could not thus far be considered sufficiently satisfactory. Supplied as sulfate, carbonate, or dolomite, the first two Mg compounds gave the quickest results; dolomite, however, showed an increasing effectiveness with time. The use of Mg top dressings increased the Mg content of the leader leaves by amounts in most cases consistent with the degree of visible improvement in the trees.

A bud canker and twig blight affecting peach trees, caused by Fusicoccum species and a Valsa species (*New Jersey Stas. Plant Disease Notes, 21 (1943), No. 6, pp. 21–24*).—In the experiments reported, all attempts to control these diseases by spraying proved ineffective, but there was some evidence that by adopting proper sanitation measures losses may be reduced to a minimum. It is suggested that where this disease complex is severe all old badly diseased trees be removed and burned and a strict program of sanitation practiced throughout the orchard. Where the disease is less severe, all diseased wood should be removed from the orchard as completely as possible two or more times a year.

Diseases of strawberries, A. G. PLAKIDAS. (La. Expt. Sta.). (*Amer. Fruit Grower, 64 (1944), No. 4, pp. 13, 22, 37, illus. 2*).—A brief conspectus of the most important leaf blights, virus and root diseases, fruit rots, and nematode diseases of strawberries, with data on control.

Diseases of gooseberry and currant, C. E. OWENS (*Oregon Sta. Cir. 152 (1943), pp. 8–11, illus. 3*).—This is a revision of Circular 42 (E. S. R., 49, p. 547).

Studies in the witches' broom disease of cacao caused by Marasmius perniciosus Stahel.—II, Field studies and control methods, R. E. D. BAKER and S. H. CROWDY (*Imp. Col. Trop. Agr. [Trinidad], Dept. Mycol, and Bact. Mem. 8 (1944), pp. 28+, illus. 7*).—As a result of a 3-yr. study of a plat of 76 trees, reported upon in this installment (E. S. R., 89, p. 88), considerable tree-to-tree variation in the disease was found, indicating differences in susceptibility. There was a marked seasonal variation in broom formation, with a maximum in January or February and a minimum around June or July. Cacao trees flush about 5–6 times a year at intervals of 60–90 days; brooms were found to appear with the appearance of the new shoots, but the total amount which the tree flushed during the year had little effect on its fan broom production. The trees flower throughout the year, but more strongly at certain seasons; flowering and cushion broom formation were strongly and positively correlated. The different types of diseased pods and their artificial production by inoculation are described; only small pods less than 6 cm. long could be successfuly infected. The resistance and susceptibility of Trinidad and South American cacao trees to the disease are discussed, and it is concluded that in the Trinidad material some degree of resistance undoubtedly exists; South American strains presumed to be highly resistant are under observation. Control methods are reviewed, and it is concluded that where the disease is severe all known procedures are either ineffective or uneconomic and that probably the only solution to the problem lies in the discovery of resistant varieties.

Stem-end rot of oranges and factors affecting its control, C. BROOKS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 10, pp. 363–381, illus. 3*).—Through studies of inoculated California and spontaneously infected Florida oranges, evidence was obtained that the decay organisms (*Diplodia natalensis* and *Phomopsis citri*) can enter fruits through the cut stem or other parts of the button. Decay was greatly increased by the ethylene treatments given for removing the green from the orange rind; possible reasons for this result are the higher temperatures of the ethylene room, aging and weakening of the buttons, and a possible stimulation of germination in *Diplodia* spores. *Diplodia* produced decay in less than half the time required by *Phomopsis,* even at temperatures somewhat more favorable to the latter. Methods are given for obtaining a continuous supply of spores of these fungi in culture. Of the various chemicals tested for decay control, only borax and sodium ortho-phenylphenate were promising. Careful controls of temperature and concentration were required with the latter in order to avoid injury.

Stubborn disease of oranges, H. S. FAWCETT, J. C. PERRY, and J. C. JOHNSTON. (Calif. Citrus Expt. Sta. et al.). (*Citrus Leaves, 24 (1944), No. 4, pp. 8–9, illus. 3*).—The main points in this paper are covered below.

The stubborn disease of citrus, H. S. Fawcett, J. C. Perry, and J. C. Johnston. (Calif. Citrus Expt. Sta. et al.). (*Calif. Citrog., 29 (1944), No. 6, pp. 146–147, illus. 2*).—A type of nonproductive Washington Naval orange trees was observed during 1915–17, and because this type, when topworked in 1921 with carefully selected buds, subsequently developed the same characteristics the trees thus affected were designated "stubborn." The history of this condition is briefly reviewed and connected up with acorn-shaped and "pink nose" fruits on the same trees. Budding indicated the trouble to be transmissible and thus probably a virus disease, though no evidence of spread in the orchard has thus far come to light. Pending further investigation, it is pointed out that the grapefruit malady in Arizona known as "crazy top" with its accompanying "acorn" fruit and "blue albedo" may be the same disease. (See also following entry.)

Acorn disease in oranges, A. R. C. Haas, L. J. Klotz, and J. C. Johnston. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 6, pp. 148, 168–169, illus. 3*).—In 1937 a grower found a branch of one of his navel orange trees bearing acorn-shaped fruits of very poor quality; surveys later disclosed the same trouble in various orchards of southern California. The seriousness of the matter lies in the fact that large and once very productive orchards have fallen off markedly in production and many of the fruits are culls. The various symptoms are described, including the lighter color or "pink nose" at the blossom end. In mature normal fruits the blossom portion is sweeter than the stem end; in affected fruits the reverse is true. An interference in the growth and development of the blossom portion was indicated. The appearance of "acorn"-type fruits in diseased navel orange trees budded to the Valencia variety suggests the transmissible or virus nature of the disease. (See also preceding entry.)

Others call it acorn disease, A. R. C Haas, L. J. Klotz, and J. C. Johnston. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 4, pp. 10–11, illus. 3*).—The subject matter is covered essentially above.

A bud failure disorder in almond trees, E. E. Wilson and G. L. Stout. (Calif. Expt. Sta. et al.). (*Calif. Dept. Agr. Bul., 33 (1944), No. 1, pp. 60–64, illus. 2*).—For a number of years a disorder characterized by failure of buds and shoots and a peculiar angular type of twig and limb growth has caused much concern to the almond industry of California. The cause is still unknown, but some evidence points to dissemination through budding and grafting, which suggests a virus etiology. The possibility that the disorder may have originated through bud variation is not ruled out; at any rate, however, it seems to have occurred in more than one variety. Investigations definitely to determine the cause and possible means of control are being made; in the meantime it seemed advisable to describe the disorder and to emphasize caution in the selection of trees for propagation.

Chemical treatments for gladiolus bulbs and bulblets before planting, D. B. Creager. (Ill. Nat. Hist. Survey). (*Gladiolus Sup.* [*New England Gladiolus Soc.*], [*8*] (*1944*), *No.* [*1*], *pp. 4–9, illus. 5; also covered in Florists Exch. and Hort. Trade World, 102 (1944), No. 15, pp. 7, 11*).—This is a brief summary of tests (1940–43) of various chemical treatments for controlling gladiolus infections carried on the surface of bulbs and bulblets. New Improved Ceresan is reported as giving the best results to date, and procedures for using it are given. A dry core rot of the Dr. F. E. Bennett and Margaret Fulton varieties was found to result from the standard mercuric chloride treatment (1–1,000 for 14 hr.); thus far these are the only varieties seriously injured.

A disease of gloxinia caused by Phytophthora cryptogea, J. T. Middleton, C. M. Tucker, and C. M. Tompkins. (Calif. and Mo. Expt. Stas.). (*Jour. Agr. Res.* [*U. S.*], *68 (1944), No. 11, pp. 405–413, illus. 4*).—The symptoms of a corm, stem, and leaf disease of gloxinia—prevalent on the San Francisco Peninsula and

around Capitola, Calif., and found due to *P. cryptogea*—consist of soft, sunken, surface lesions and internal dark-brown, soft necrotic areas 1–8 mm. in diameter. Diseased stems bear sunken water-soaked lesions which may be rather narrow and vertically disposed or large and encompassing the stem; infected leaves are water-soaked, dark brown, and flaccid. The cardinal points of temperature for mycelial growth are below 1°, 22°–25°, and 31°–34° C. In addition to gloxinia, the pathogenicity of the fungus has been demonstrated for 9 genera and 15 species of the Gesneriaceae; cineraria, cockscomb, and slipperwort are newly reported hosts. This is apparently the first record of the fungus on gloxinia and the first instance on leaves of any host.

Anguina klebahni n. sp. (Tylenchidae), ein Nematode in Blüten von Primula florindae Ward [A nematode infesting the flowers of the Tibetan primrose], H. Goffart (*Zool. Anz., 138 (1942), No. 5–6, pp. 174–179, illus. 3*).

Relation between hot-water extractives and decay resistance of black locust wood, T. C. Scheffer, H. G. Lachmund, and H. Hopp. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 11, pp. 415–426, illus. 2*).—On the basis of tests with *Fomes rimosus,* the amount of hot-water extractives in the wood of *Robinia pseudoacacia* was found to account largely for the decay resistance of the heartwood at different radial positions in the cross sections of individual trees, but only in small degree for variations in decay resistance among different trees or different selections of the species. Thus, the toxic composition of the extractives appeared comparatively uniform within individual trees but not among different trees. A similar but no closer relation was found between decay resistance and the toxicity of the hot-water extractives when concentrated in proportion to the amounts present in the wood. Theoretically the joint effect of both amount and toxicity of extractives should provide a better index of decay resistance than the amount of extractives alone; a number of reasons are suggested for its failure to do so.

Phomopsis blight of grafted cedars, C. M. Slagg. (U. S. D. A. coop. Kans. Expt. Sta.). (*Amer. Nurseryman, 79 (1944), No. 8, p. 9*).—Certain horticultural varieties of the Rocky Mountain juniper *Juniperus scopulorum* propagated only by grafting are widely grown in Kansas; during the past 2 yr. many of these grafted trees were found badly infected with *P. juniperovora.* Observations of the grafting method and of the grafted trees in the nursery indicated that many of the seedling stocks were infected—probably systemically—before the grafting operation and later passed the disease along to the graft. For use until more definite control measures can be worked out, certain recommendations based largely on field observations have been forwarded to interested nursery operators; these are here summarized.

Decay in balsam fir in New England and New York, P. Spaulding and J. R. Hansbrough (*U. S. Dept. Agr., Tech. Bul. 872 (1944), pp. 30, illus. 5*).—On plats in eastern Maine, northern New Hampshire, and the Adirondack Mountains of New York, more than 1,100 *Abies balsamea* trees 40 yr. old or over were dissected, a fourth of the total volume being culled for decay. The three principal rots found were top or trunk rot (*Stereum sanguinolentum*), white stringy butt rot (*Poria subacida*), and brown butt rot (*Polyporus balsameus*). Of the total cull, these fungi caused 54, 28, and 13 percent, respectively. The butt rots first appeared at 1-ft. stump height at 40 yr., affected half of the trees at 72 yr., and caused cull in half of the trees at 105 yr. Top rot appeared at 40 yr., affected one-fifth of the trees at 90 yr., and usually caused much more cull in each affected tree than the butt rots. At 70 yr. the butt rots induce wind throw, causing serious losses. This damage dictates setting the rotation at 70–80 yr., although the pathological rotation might be somewhat longer. Decay cull increases with age. Net periodic growth of fast-grown trees exceeded that of the slow-grown by a ratio of 4 : 1 up to

damage dictates setting the rotation at 70–80 yr., although the pathological rotation 20-yr. cutting intervals, and that young stands be grown at a uniformly rapid rate by suitable thinning and freeing from overtopping hardwoods.

The brown spot needle blight of pine seedlings, P. V. SIGGERS (*U. S. Dept. Agr., Tech. Bul. 870 (1944), pp. 36, illus. 11*).—This needle disease (due to *Scirrhia acicola*) is considered one of the major obstacles to increased production on the 9 million acres of cut-over longleaf pineland in the South now barren of forest growth of southern longleaf pine (*Pinus palustris*)—a forest resource that furnishes 40 percent of American-produced turpentine and rosin, makes up a large proportion of the total annual cut of southern yellow pine, and, because of its long fiber, is well adapted for paper pulp. These investigations—begun in 1929—involved a study of the organism causing the disease, a survey of infected areas, a study of the results of earlier investigations, and experiments with possible control measures.

Studies of environal effects on germination, growth, and fructification of the fungus indicated that dry laboratory storage adversely influences the spore vitality. The upper thermal limit for germination was about 35° C.; the lower 5°–10°. The minimum and maximum temperatures for growth appear to be slightly below 5° and at 35°, respectively, and the optimum slightly above 25°. Viable conidia developed in single-spore cultures in a minimum of 14 days. Earlier work indicating that conidia of the pathogen are disseminated by rain splash was confirmed; on the other hand, the ascospores were dispersed largely by air currents. The dwarfing effect of successive annual defoliations on height growth of stands was studied under natural conditions by controlling the disease over a period of years and comparing the subsequent growth of sprayed seedlings with that of untreated and diseased seedlings in adjacent plantation rows. Height growth of one stand has already been delayed more than 10 yr. In a second plantation the average height of sprayed seedlings at the end of their eighth season in the field was 11 ft. 2 in.; that of diseased seedlings, 1 ft. 1 in. Complete defoliation as a seasonal pathological process retarded annual height growth in the next season to a seventh or less of that of adjacent sprayed seedlings. The detrimental effect on survival in plantations was indicated by greater mortality among unsprayed lots of seedlings in older demonstration areas. The growth capacity of stunted, diseased longleaf pines can be altered by improving the chemical composition of the soil, heavy applications of a 3–10–3 fertilizer inducing rapid growth in height among several seedlings in a field test plat. After fertilization, the quantity of uninfected foliage gradually increased and as the capacity to elaborate reserve food improved, rapid growth in height followed. Spraying and soil amendments, except under nursery conditions, do not appear economically feasible for controlling the disease. The minimum spray treatment needed to insure a satisfactory sapling stand would increase the cost of a plantation by at least $4 an acre. Control of the disease by periodic use of fire, as originally recommended by Chapman (E. S. R., 55, p. 342), appears to be the rational procedure where the disease is serious on areas of reproduction. In general, the sanitary effect of a given fire will depend on the size of the area burned, the intensity of the fire, the quantity of wind-blown inoculum, and seasonal meteorological conditions.

Susceptibility of whitebark pine to blister rust in the Pacific Northwest, J. L. BEDWELL and T. W. CHILDS. (U. S. D. A.). (*Jour. Forestry, 41 (1943), No. 12, pp. 904–912*).—Although of little commercial value, *Pinus albicaulis* is often of considerable importance in connection with recreation and watershed protection. Studies in nursery beds and natural stands indicated that in the Pacific Northwest (southern British Columbia, Wash., Oreg., Idaho, and western Mont.) it is much more susceptible to blister rust than *P. monticola*. Infection will probably become common within the next few decades, but it is believed doubtful whether this

species will be particularly influential in hastening the spread of the disease in this region. Because of its exceedingly high susceptibility and probably also because of the favorable conditions for infection frequently occurring at high altitudes in this region, whitebark pine is apparently subject to serious infection at distances from *Ribes* greater than those over which the rust can usually spread to white pines. Control by *Ribes* eradication may be supplemented, where scenic values warrant, by the pruning of infected branches.

Notes on Cronartium occidentale, C. R. STILLINGER. (U. S. D. A.). (*Northwest Sci., 18 (1944), No. 1, pp. 11–16*).—Infections in nature with *C. occidentale* of *Ribes lasianthum, R. hesperium, R. parishi, R. roezli, R. speciosum, R. cereum, R. indecorum, R. malvaceum, R. nevadense,* and *R. montigenum* are the first reports for these species. Collections on *R. inerme* in California, *R. aureum* in Montana and Nevada, and *R. odoratum* in Idaho are first reports of the rust on those hosts for these States. The presence of *C. occidentale* in Montana and Nebraska has not been previously reported. The apparent spread of aeciospores from piñon pines to *Ribes* for a distance of 650 miles from known infected piñons and 425 miles beyond the known range of these pines is reported. *C. occidentale* will overwinter on living *Ribes* leaves. Because of the similarity of the white pine and piñon blister rusts these data suggest that a much longer distance of spread of *C. ribicola* is possible from pine to *Ribes* than has previously been reported.

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Cornell University abstracts of theses, 1942 (*Ithaca, N. Y.: Cornell Univ. Press, 1943, pp. 260–263, 268–271, 277–279, 293–295, 306–308, 312–314, 321–334, 338–342, 345–347*).—The following are of zoological or. entomological interest: Studies on the Control of Codling Moth (*Carpocapsa pomonella* Linn.) With Dusts, by G. E. Carman (pp. 260–263); Toxicity of Rotenone and Derris Extracts Administered Orally to Birds, by L. K. Cutkomp (pp. 268–271); Apple Insects of New York, Their Regional Distribution, Seasonal Development, and Economic Importance in Relation to Control Measures, by J. A. Evans (pp. 277–279); The Comparative Morphology, Variation, and Seasonal Studies on the Genitalia of Local Species [of Land Snails] of the Family Polygyridae, by R. C. Howard (pp. 293–295); The Distribution of Fishes in the Streams of Western Massachusetts, by B. C. McCabe (pp. 306–308); The Taxonomy, Biology, and Genital Physiology of the Giant West Coast Land Slugs of the Genus *Ariolimax* Morch (Gastropoda: Pulmonata), by A. R. Mead (pp. 312–314); The Viscosity and Thixotrophy of Honey, by J. A. Munro (pp. 321-324); Population Levels of Small Mammals in Various Habitats of Central New York, by R. B. Priddy (pp. 325–328); Biology and Control of the Mexican Bean Beetle (*Epilachna varivestis* Mulsant), by M. J. Ramsay (pp. 329–331); The Pathogenicity of Three Strains of *Trichinella spiralis* as Indicated by Longevity and Sex Ratio of the Adults and the Degree of Muscle Parasitism, by I. Rappaport (pp. 332–334); The Biology of a Small Mammal Community in a Central New York Woodlot, by R. A. Smith (pp. 338–342); and The Biology of the Pocket Gopher (*Thomomys talpoides*), by C. A. Tryon, Jr. (pp. 345–347).

How soil conservation aids wildlife, H. H. BENNETT. (U. S. D. A.). (*Audubon Mag., 46 (1944), No. 2, pp. 76–86, illus. 11*).—The author presents some revealing facts concerning the increase in bird populations on farms.

Rabbit production for meat, M. P. CHAPMAN and J. LONG (*Oregon Sta. Cir. 155 (1943), pp. 31, illus. 10*).—This is a general informatory manual on the raising of rabbits, including such matters as selecting the breeding stock and breeding, housing and equipment, management, feeding, slaughtering and skinning, rabbit pelts, diseases and parasites, and rabbit recipes. A list of available publications on rabbits is included.

Formulation of rat baits, J. C. WARD (*Soap and Sanit. Chem., 19 (1943), No. 12, pp. 127, 129, 143B; also in Pests, 12 (1944), No. 2, pp. 17–18, 27–28*).—This address summarizes the specifications for an ideal rat bait, reviews the present situation on wartime shortages of various poisons and food materials used in such baits, and makes suggestions as to the more satisfactory substitutes available. It is pointed out that research to find new rodenticides is being emphasized, with much attention devoted to the field of synthetic organic chemicals.

The sensory basis of bird navigation, D. R. GRIFFIN (*Quart. Rev. Biol., 19 (1944), No. 1, pp. 15–31, illus. 2*).—The literature on artificial homing experiments with wild birds and racing pigeons is critically reviewed (104 references), and all of the tests involving long distances and reasonably large numbers of birds are summarized in tabular form. After a consideration of several theoretical explanations of the sensory basis of homing, together with the evidence pro and con, it is concluded that use of familiar landmarks, along with simple geographical, meteorological, and ecological relationships such as those described in the paper, seems more reasonable as an explanation of migration and homing than the postulation of a new sense organ.

Seventeen years of banding white-throated sparrows and slate-colored juncos at Michigan State College, J. W. STACK and R. L. HARNED. (Mich. Expt. Sta.). (*Bird-Banding, 15 (1944), No. 1, pp. 1–14, illus. 3*).—A historical account of this work, with summaries of the results for the two species. In general, the fall migration covered a greater period of time and was less regular than the corresponding spring period for both the juncos and the sparrows.

Studies of the fish population on the shoal area of a TVA main-stream reservoir, R. W. ESCHMEYER, R. H. STROUD, and A. M. JONES (*Jour. Tenn. Acad. Sci., 19 (1944), No. 1, pp. 70–122, illus. 3*).—A study was made (1942) of the distribution and abundance of fish on the shoal of Chickamauga Reservoir, the third of a series of eight reservoirs which impound the Tennessee River. In 153 hauls of a 689-ft. seine, covering about 1.2 acres per haul, the average catch was 131 fish. This number included 10 game and pan fish and 2.5 food fish; the others, representing over 90 percent of the catch, were rough fish. This study, reported upon in detail, lends support to the belief that the rough-fish problem is of primary importance on TVA main-stream reservoirs and it also suggests rather emphatically that in this reservoir commercial fishing cannot be expected to lead to a more favorable balance between game and rough fish. In discussing the draw-down method of control, it is not implied that this procedure would be successful in solving the problem of balance; it is merely stated that for the present it appears to be the best "tool" available.

Fish migration into the Clinch River below Norris Dam, Tennessee, R. W. ESCHMEYER (*Jour. Tenn. Acad. Sci., 19 (1944), No. 1, pp. 31–41*).—The conversion of the Tennessee River into a series of reservoirs and the impounding of a number of waters tributary to it have apparently produced extensive changes in fish movement as well as in the relative abundance of the various river species. The author presents data on white bass, largemouth bass, and sauger relative to their growth, condition, food, maturity, and migration.

Observations on the migration of fishes from the Cherokee Reservoir, A. R. SHIELDS (*Jour. Tenn. Acad. Sci., 19 (1944), No. 1, pp. 42–44*).—The author presents evidence from this TVA reservoir of the influence reservoirs have on the fish populations of all their tributaries, with special reference to the food thus furnished to the populace through which these streams flow. "Instead of the fisherman having to go to the lake, the fish are coming to the fisherman."

Fish production in farm ponds, A. D. ALDRICH, F. M. BAUMGARTNER, and W. H. IRWIN (*Oklahoma Sta. Cir. 115 (1944), pp. 8, illus. 2*).—This circular was prepared to answer the ever-increasing number of inquiries concerning the management of ponds for fish production.

Fish for food from farm ponds, V. E. Davidson and J. A. Johnson (*U. S. Dept. Agr., Farmers' Bul. 1938, rev. (1944), pp. 22+, illus. 9*).—A revision (E. S. R., 89, p. 462) with many changes.

On the systematic relationships of the vinegar eelworm, Turbatrix aceti, and its congeners, with a description of a new species, T. Goodey (*Jour. Helminthol., 21 (1943), No. 1, pp. 1–9, illus. 16*).—Study of a nematode closely akin to the species found in paperhanger's paste but differing somewhat in anatomical details afforded the author an opportunity for considering the systematic relationships of this worm and its congenators, with the result that a grouping believed more satisfactory is presented, including *Turbator redivivoides* n. gen. and sp.

[Notes on insects and insecticides] (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 291–319, illus. 6*).—Contributions presented (E. S. R., 91 p. 310) are Results of Tests With Domestic Animals Confined on Pastures Sprayed With Natural Cryolite, by B. H. Wilford and L. O. Mott (p. 291), Insecticidal Possibilities of [the Alkaloid in] *Duboisia hopwoodii,* by C. W. Bowen (p. 293), Control of the Vegetable Weevil in Tobacco Plant Beds, by F. S. Chamberlin (pp. 293–294), Dichloropropane-Dichloropropylene, a New Soil Fumigant for Wireworms, by M. W. Stone (pp. 297–299), A Graphic Method of Indicating the Incidence of an Insect Population, by M. A. Yothers and F. W. Carlson (pp. 300-301), "Incompatability" of Insecticides, by R. C. Roark (p. 302), Chloropicrin Treatment of Bulk Potting Soil for Japanese Beetle Control, by H. C. Donohoe (p. 305), Observations on Nematodes Associated With White Grubs, by T. R. Chamberlin (pp. 313–314), Safened Forms of Calcium and Lead Arsenate, by S. F. Potts (pp. 314-315), and Screwworm Survey in the Western Area of the United States in 1943, by E. W. Laake (p. 319) (all U. S. D. A.); Control of the Common Red Spider [*Tetranychus telarius*], by R. L. Parker (p. 292) (Kans. Expt. Sta.); Lethane 384 Special for Control of the Brown Dog Tick, by G. H. Plumb (pp. 292–293) (Conn. [New Haven] Sta.); A Simplified Method of Sampling Known Areas of Apple Leaves for Chemical Analysis, by F. H. Lathrop, B. E. Plummer, and C. O. Dirks (pp. 294–295) (Maine Sta.); Mineral Oils as Diluents of the Geraniol-Eugenol Japanese Beetle Bait, by M. H. Muma, G. S. Langford, and E. N. Cory (pp. 295-297) (Univ. Md.); Gynandromorphism in Recently Collected Mosquitoes, by W. W. Middlekauff (p. 297); Toxicity of Natural and Synthetic Cryolites to Rats, by H. L. Sweetman and A. I. Bourne (pp. 299-300); Dusting Device for Toxicity Experiments on Field Grown Plants, by E. E. Ivy (p. 301) (U. S. D. A. coop. Tex. Sta.); Substitutes for Creosote in Chinch Bug Barrier Construction, by G. C. Decker (pp. 303–305) (Iowa Sta.); San Jose Scale Control Experiments, by P. J. Chapman, A. W. Avens, and G. W. Pearce (pp. 305–307) (N. Y. State Sta.); Dowfume to Kill Nematodes in Potting Soil, by L. L. English (p. 307) (Ala. Sta.); Tomato Hornworm [*Protoparce sexta* (Johan.) and *P. quinquemaculata* (Haw.)] Control, by H. G. Walker and L. D. Anderson (p. 308) (Va. Truck Sta.); Control of the Long-Tailed Mealybug [*Pseudococcus longispinus* (Targ.)] on Avocados by Hymenopterous Parasites (pp. 308–309) and Biological Control of the Potato Mealybug [*Phenacoccus solani* Ferris] (p. 312), both by S. E. Flanders (Calif. Citrus Sta.); Toxicity of Sodium Fluosilicate to Livestock, Poultry, and Game, by J. R. Parker and G. G. Schweis (pp. 309–310) (U. S. D. A. et al.); Effects of Nicotine Dust on the Melon Aphis and Its Natural Enemies, by R. R. Walton and F. E. Whitehead (pp. 310–311) (Okla. Sta.); Technique for Studying the Residual Value of Organic Insecticides, by B. C. Dickinson (pp. 311–312) (Ohio State Univ.); A Malaria Mosquito Survey of Southern Michigan, by C. W. Sabrosky (pp. 312–313) (Mich. State Col.); Arsenic Content of Vegetables Grown in Soils Treated With Lead Arsenate, by H. C. McLean, A. L. Weber, and J. S. Joffe (pp. 315–316) (N. J. Stas.); and Further Tests of Dusts in Control of Mirids and Pentatomids, by J. T. Medler and E. J. O'Neal (pp. 316–318) (N. Mex. Sta. et al.).

Algunas observaciones entomológicas [Some entomological observations], E. J. MacDonaugh (*Univ. Nac. La Plata, Rev. Facult. Agron. 3. ser., 25 (1940) (pub. 1943), pp. 69–88, illus. 16*).—The following are considered: The spittle insects—their polyphagism (on *Cephisus siccifolius*); the greenhouse mealy-bug *Pseudococcus longispinus* Targ.; coleoptera finding refuge in a bird nest; the bean weevil; decomposition of fish guano and soap by coleoptera; and *Solanophila paenulata* Germ., a ladybird beetle pest of string bean ("chauchas").

Entomology and soil conservation, P. F. Allan. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 321–323*).—An editorial on the interrelationships and mutual problems of soil conservation work and entomology.

Relation of entomology to the war effort, H. B. Hungerford (*Kans. Acad. Sci. Trans., 46 (1943), pp. 303–308*).—A general discussion.

The [U. S.] Bureau of Entomology and Plant Quarantine and wartime pest control, S. A. Rohwer. (U. S. D. A.) (*Pests, 12 (1944), No. 3, pp. 8–9, 31, 32–33*).

Some aspects of moisture in its relation to insect pest control, A. E. Michelbacher. (Univ. Calif.). (*Pests, 12 (1944), No. 2, pp. 21–23*).—A general discussion with illustrative examples and the conclusion that, although increasing the moisture can be utilized in certain cases to control insects, drying out of the environment has a much wider application against most household and stored product pests.

Value of the p^F scale of soil moisture for expressing the soil moisture relations of wireworms, A. C. Evans (*Nature [London], 152 (1943), No. 3844, pp. 21–22, illus. 1*).—It has been shown by Woodworth (E. S. R., 80, p. 79) that the cuticle of wireworms (*Agriotes* spp. and *Limonius* spp.) is freely permeable to water and to arsenite ions; the author reports a confirmation of these findings, with an extension to show that when anesthetized wireworms (to prevent drinking and excretion) are immersed in sucrose solutions of various concentrations, they behave as an osmotic system bounded by a semipermeable membrane. Furthermore, observations described for normal wireworms in a rich loam soil at a series of moisture contents, along with the results of tests on other soils, confirmed that the rate of water loss is governed by the "suction" and not by the moisture content of the soil. It is deemed quite clear that the p^F scale suitably expresses the dryness or wetness of a soil in relation to the loss of weight in wireworms and should prove of value in studies of a similar kind.

Organic iodine compounds tested against insects, fungi, and bacteria: A review of the literature, C. V. Bowen (*New York 5, N. Y.: Iodine Ed. Bur., Inc., 1944, pp. 20+*).—"The present war has caused a shortage of certain insecticides. . . . Since there is now a surplus of iodine in this country, it was thought that some of it might be used for the production of synthetic iodine compounds that have insecticidal value. The logical starting point in such a program is the review of the organic iodine compounds that have been tested for toxicity against insects, fungi, and bacteria." Such a review (111 references) is here presented, along with a list of patents cited by countries of origin.

Fluorine compounds as alternates for rotenone-bearing dusts, N. Turner. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 242–245*).—With the number of treatments, intervals between them, and relative time of taking results used, the dosage comparisons for cryolite and rotenone in derris dust were as follows: For the Mexican bean beetle, 50 percent cryolite proved no more effective than 0.25 percent rotenone; for cabbageworms (chiefly loopers), 12.5 percent cryolite was more effective than 0.5 percent rotenone; for flea beetles on potatoes, cryolite at 50 percent was slightly less effective than rotenone at 0.5 or 1 percent; for control of the European corn borer on potatoes, 50 percent cryolite

was more effective than 1 percent rotenone. The interval between treatments favored cryolite in the test on cabbages and rotenone in the one on potatoes. In the single test involving diluents, results varied, but in three of four cases pyrophyllite was more effective than clay. There were large variations in the tests comparing natural and synthetic cryolites; no consistent differences in results between them could be discerned.

Size specifications for fine powders, E. L. Gooden. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 204–208, illus. 4*).—The author drafts particle-size specifications for insecticidal powders (including diluents) fine enough to pass through the finest testing sieves, the ordinary dusting and spraying preparations coming within this class. The point of transition from the sieve range to the subscreen region is at a unique place in the scale of sizes, the boundary being roughly that between visible and microscopic particles. An example of specifications framed according to the principles here set forth, but omitting some of the details, is the following for moderately fine sodium fluosilicate: At least 90 percent by weight shall pass a U. S. Standard No. 325 (44μ) sieve, by dry test. The surface-mean diameter by air permeation test shall be not more than 9μ. These qualifications are satisfied by one of the commercial grades.

Petroleum oil spray recommendations and precautions in their use, L. Childs and R. H. Robinson (*Oregon Sta. Cir. 151 (1943), pp. 8*).—A practical account.

The use of explosives for the application of insecticide dusts, R. D. Glasgow and R. Blair (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 230–234, illus. 4*).—Since controlling insect pests of mature park or forest areas and the like by conventional procedures is difficult, expensive, or otherwise impractical, the authors explored the possibility of using explosives for propelling insecticidal dusts into the air to be carried by air currents over the area to be treated. From the results of the preliminary tests reported, the authors believe the method to hold promise in many fields of pest control, not only in times of peace but also in war zones and training areas.

Timing the seasonal cycles of insects, F. H. Lathrop and C. O. Dirks. (Maine Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 199–204, illus. 6*).—When insect life history data, including several years' records charted on the calendar-date scale, were rearranged to the petal-fall scale, the relative positions of the annual records were modified and their summaries changed. When the records included a sufficient number of years, the data on each scale approached the form of a normal distribution curve; the means on both scales approximately coincided but the deviation from the mean was distinctly less on the petal-fall scale. Use of the phenological scale formed a smoother curve than the time scale when the records included a comparatively small number of individuals. Compared with the calendar scale, the petal-fall scale offered a somewhat better basis for considering data covering several years in one locality or for comparison of data for two or more separate localities. The petal-fall scale rendered possible the prediction, within closer time limits, of the occurrence of events in the life cycles of insects. It is believed probable that the phenological scale may form a useful basis for studying the effects of temperature and other factors influencing the seasonal cycles of insects.

A study of the relationship existing between certain insects and some native western Kansas forbs and weedy plants, C. T. Brandhorst (*Kans. Acad. Sci. Trans., 46 (1943), pp. 164–175, illus. 19*).—The 10 native prairie plants examined as collected from 15 areas in western Kansas were found to be hosts to a large population of insects; of these, 46 were studied. The rate of infestation varied from 0.45 to 68 percent. Several species proved to be effective checks on their host plants, whereas the majority seemed to have but little effect on them. The

distribution of these insects varied from a single area to 8 widely separated locations. The data are discussed and tabulated in some detail.

Observations on parasities of some Canadian grasshoppers, R. W. Smith (*Canad. Ent., 76 (1944), No. 2, pp. 28–33*).—The study thus far has been confined largely to the Prairie Provinces and has dealt primarily with the nymphal and adult stages of three pest species, viz, the clear-winged grasshopper, the lesser migratory grasshopper, and the two-striped grasshopper. Up to the present, 17 species of parasites have been reared from nymphal and adult grasshoppers, 15 of them primaries and 2 secondaries. The primaries include 14 species of Diptera and 1 mermithid mite; both secondary species are Hymenoptera. These parasites are listed and discussed along with tabulated data.

Studies on the ecology and control of the Moroccan locust (Dociostaurus maroccanus) in 'Iraq.—I, Results of a mission of the 'Iraq Department of Agriculture to N. Iraq in spring 1943, F. S. Bodenheimer (*Iraq Dir.-Gen. Agr. Bul. 29 (1944), pp. 121+, illus. 37*).—The general program of this mission was to test the methods used in recent years for controlling *D. maroccanus* under Iraq conditions and to promote the knowledge of its ecology and biology, with special reference to the factors influencing the rise and fall of outbreaks. Control methods found best in other countries (Russia, French North Africa, Spain, Turkey, etc.) were shown to be the proper ones to use under Iraq conditions, and it is considered that the spreading of poisonous bait is the standard procedure against this pest. The increased importance of the invasion zone for the final building up of huge swarms is considered of practical importance, since the locust campaign must be directed primarily against the gregarious swarms in this zone. The advisability of baiting the locusts on the first and second oviposition sites to prevent later ovipositions is stressed.

A revision of the genus Chlorosea Pack., with descriptions of new species (Lepidoptera: Geometridae), J. L. Sperry (*Canad. Ent., 76 (1944), No. 2, pp. 33–39, illus. 1*).—Of the five species of this genus of geometrid moths here discussed, two are described as new.

Phase variation in the army worm Laphygma exempta (Walk.), J. C. Faure (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 234 (1943), pp. 17+, illus. 14*).—This armyworm is said to be a major pest in southern Africa; a summary of the last 36 yr. from both published and unpublished reports showed a ratio of 2 seasons with outbreaks to one free of them and in the last 24 seasons the ratio was 3 : 1. The studies here reported upon deal with the life history of the insect, and especially in regard to phase variation in the larvae, the characteristics of phases, and attempts to intensify them. An account of preliminary field observations and a theory of migration are also presented. Since grasses of the genus *Cynodon* appear to be among the favorite food plants, additional notes are presented thereon, as well as with respect to two other pests—a noctuid (*Spodoptera abyssinia* Guen.) and a chrysomelid beetle (*Galerucella triloba* F.).

The natural control of Pieris brassicae by its braconid parasite Apanteles glomeratus, N. L. Birkett (*Entomologist, 77 (1944), No. 968, pp. 13–14*).—Note on a case of about 96 percent parasitization of pupae among a total count of 494.

Comparative study of mouth parts of representative Hemiptera-Homoptera, F. H. Butt ([*New York*] *Cornell Sta. Mem. 254 (1943), pp. 20+, illus. 51*).

Considerações sobre Cephisus siccifolius (Walker, 1871) (Homoptera: Cercopidae), C. R. Hathaway (*Mem. Inst. Oswaldo Cruz, 38 (1943), No. 3, pp. 443–446, illus. 5*).—A brief general discussion of this species of froghopper, with lists of spontaneous (legumes preferred) and experimental host plants.

A first survey of the Coccoidea of Iraq, F S. Bodenheimer (*Iraq Dir.-Gen. Agr. Bul. 28 (1943), pp. 33+, illus. 27*).—A copiously annotated list of about 60

species of this homopterous group encountered in the survey, a brief zoo-geographical analysis of the findings, and descriptions of three new mealybugs (*Rhizoecus dactyloni, Phenacoccus poterii,* and *P. sherbinovskyi*) from Iran and Palestine are presented.

A list of Hemiptera taken at Hudson Heights, Quebec, G. A. Moore (*Canad. Ent., 76 (1944), No. 2, pp. 40-44*).—The list includes 237 species of Heteroptera and 218 of Homoptera and adds the names of many species not hitherto recorded from the Province of Quebec.

A new genus Mexicananus and species of leafhopper from Mexico related to Phlepsius and Texananus, D. M. DeLong. (Ohio State Univ.). (*Ohio Jour. Sci., 44 (1944), No. 2, p. 89*).—*Mexicananus levis* n. gen. and sp. is described.

Three new mites of the subfamily Rhizoglyphinae, H. H. J. Nesbitt (*Canad. Ent., 76 (1944), No. 2, pp. 21–27, illus. 13*).—The new species described are *Caloglyphus anomalus* from decaying lily bulbs, *Rhizoglyphus rotundatus* from a mushroom in a peat bog, and *Eberhardia* (*Cosomoglyphus*) *pedispinifer* from rotting wheat.

Carpenter ant control in Oregon, R. L. Furniss. (Coop. U. S. D. A.). (*Oregon Sta. Cir. 158 (1944), pp. 12, illus. 4*).—A practical account.

Hessian fly control in Nebraska by late sowing of winter wheat, H. H. Walkden, J. R. Horton, and F. M. Wadley. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 360 (1944), pp 11, illus. 6*).—The studies reported were conducted at several localities in eastern Nebraska from 1923 to 1935. Wheat was generally sown on five dates from 3 days to 1 week apart, centering around the expected safe date. Three tables summarize the main results. These records indicate the probability of considerable fly infestation in the region in perhaps a third of the years. There is the possibility of severe crop damage in 1 yr. out of 10. Seeding wheat about October 1 has given practical freedom from fall infestation in most years, including about two-thirds of the years of severe infestation. Planting on about this date gave satisfactory yields over an 11-yr. period as compared with earlier sowings, but sowing somewhat later was accompanied by marked reduction in yield in 1 yr. of the series. The fact that growers cannot take advantage of favorable weather and soil conditions for sowing before the safe date and the increased hazard of reduced yields due to winter-killing of extremely late sowings must be considered. However, these data indicate delayed sowing to be a fairly satisfactory method for preventing hessian fly losses.

The plant bugs, Miris dolobratus L. and Amblytylus nasutus Kirschbaum, and their injury to Kentucky bluegrass (Poa pratensis Linn.), H. H. Jewett and J. T. Spencer. (Ky. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 147–151, illus. 1*).—It was shown from a number of controlled tests (1942) that the meadow plant bug is a factor in reduced seed production and when abundant could prevent its development in Kentucky bluegrass, and that *A. nasutus* was capable of about as much damage. Seed analyses indicated that when infested, bluegrass produced seed of lower weight and germinability than when uninfested. The presence of *A. nasutus* in bluegrass fields in large numbers in 1942 suggests that it must have been there in considerable numbers for several seasons. If this be true, it may have been responsible for much of the damage to the seed crop instead of the better-known meadow plant bug. It is believed likely, however, that the lessened production of bluegrass seed in the last 4–5 yr. was due to the combined injuries by both species.

The European corn borer and its control, C. J. Drake, G. C. Decker, and H. M. Harris (*Iowa Sta. Bul. P60 (1944), pp. 921–936, illus. 13*).—A practical account.

Apanteles diatraeae, a braconid parasite of the southwestern corn borer,

E. G. Davis (*U. S. Dept. Agr., Tech. Bul. 871* [*1944*], *pp. 19, illus. 12*).—*A. diatraeae* Mues., which is indigenous to the West Indies and Mexico, has become established in southeastern Arizona. This internal parasite preys upon the larvae of the southwestern corn borer and during the period 1931-34 destroyed an average of 32.5 and 78.9 percent of borers of the second and third generations, respectively, at Tucson. Four generations occur annually in southeastern Arizona. Parasitization is accomplished by an adult parasite thrusting its ovipositor into the larval body of the host and injecting a mass of eggs. The egg and nearly all of the larval stage are spent within the host. The larvae when full grown emerge in a group and spin a mass of pupal cocoons, from which the adults subsequently emerge and disperse among the corn plants. Descriptions of the different parasite stages are presented. Economicaly *A. diatraeae* has considerable possibilities. The southwestern corn borer spreading northward from Mexico has advanced to the edge of the Corn Belt in Kansas, whereas the parasite has progressed only as far as southeastern Arizona. Thus by distributing the parasite throughout most of the uninfested corn borer territory in the United States its effectiveness in controlling the borer might be greatly increased. Attempts to colonize *A. diatraeae* to combat the sugarcane borer have not been successful.

Relation of planting dates of corn and Japanese beetle injury, G. S. Langford, R. G. Rothgeb, and E. N. Cory. (Univ. Md.). (*Jour. Econ. Ent., 37* (*1944*), *No. 2, pp. 253–257, illus. 4*).—The authors review the conditions encountered in the field and present experimental data on corn ear damage as it pertained to moldy corn and the loss in grain from silk destruction. Analysis of the results indicated that Japanese beetles may seriously damage field corn in Maryland, particularly if it silks before August 10; considering all the tests, the percentage loss ran as high as 40.6 percent and the loss in bushels reached a total of 23.2 bu. per acre. The abundance of beetles at silking time is the important factor in the amount of damage done; late planting has consistently reduced the beetle injury. A survey of data over a 6-yr. period showed that when it is possible to plant corn so that it silks after the peak of the beetle infestation damage will be negligible. The marginal period for planting to avoid both beetles and frost is, however, narrow, and there is no certain planting date that will guarantee freedom from both. Records from experimental plats indicated that in years favorable to mold development, the percentage of infected corn ears was greatest in fields where the tips of the ears had been opened by beetle feeding; corn silking after the peak beetle infestation developed fewer moldy ears. The beetles show a decided preference for some varieties or hybrids; in a series of plantings they congregate on the preferred hosts, but in the absence of preferred food plants serious damage may result to a variety showing resistance when planted in a mixed series.

Pea aphid work in Maryland during 1943, L. P. Ditman, E. N. Cory, and H. B. Owens. (Md. Expt. Sta.). (*Jour. Econ. Ent., 37* (*1944*), *No. 2, pp. 258–261*).—The results of a 5-yr. program on pea aphid control have been referred to previously (E. S. R., 89, p. 711). In the supplementary work of 1943 here reported, the regular spray of 3 lb. ground derris with a wetting agent considerably outperformed the other treatments, which included some preliminary tests with concentrated sprays. The 1 percent rotenone (derris), even though it had been stored for a year, gave a slightly better kill of aphids than any of the reduced rotenone dusts even though some of them contained 2 percent nicotine. In the concentrated spray tests Tubicide compared favorably with the 1 percent rotenone (derris) dust. Nicotine sulfate and pyrethrum sprays failed to perform as well as Tubicide. A survey of commercial pea aphid treatments over the State in 1943—briefly summarized—led to the belief that failures in control of the pea aphid may be attributed to ineffective materials or methods of application.

Seedbed and field experiments to control tobacco flea beetles, J. M. Grayson. (Va. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 224–230*).—Although *Epitrix hirtipennis* (Melsh.) is usually considered most injurious in tobacco seedbeds, it is often a serious pest also in the field. Among the seven dust treatments used in this investigation for seedbed application, there was no significant difference between sodium fluoaluminate at 90-, 70-, and 50-percent dilutions and the paris green-lead arsenate mixture (1–5); or between the 90-percent dilution and undiluted basic copper arsenate. The latter, however, was significantly better than the average of the four treatments. No injury resulted from any of the treatments except the paris green-lead arsenate at rates in excess of 0.5 lb. per 100 sq. yd. of seedbed. More difficulty was had in obtaining uniform coverage with the 90 and 30 percent sodium fluoaluminate dusts than with any of the other treatments. When Alorco Cryolite and Kryocide at 70-percent dilutions were applied as emergency treatments to the seedbeds, the former gave better protection of young plants from flea beetle injury but was more difficult to apply in uniform amounts. In the field experiment, DN Dust D–4 was not significantly better than the control, nor were there significant differences among basic copper arsenate spray and basic copper arsenate and sodium fluoaluminate dusts, but the average of these treatments was significantly better than Genicide. Bronzing of the leaves resulted from the last when used at rates above 2.5 percent; no injury resulted from any of the other materials. A more uniform coverage of dust was obtained with the basic copper arsenate and DN Dust D–4 than with Genicide and sodium fluoaluminate. The literature (12 references) on control of tobacco flea beetles is briefly reviewed.

Vegetable insects and their control on commercial plantings, B. B. Pepper (*New Jersey Stas. Cir. 476 (1944), pp. 15*).—A practical account.

A low rotenone content Derris malaccensis dust effective against certain vegetable pests, B. B. Pepper and R. S. Filmer. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 37 (1944), No 2, pp. 248–252*).—There appears to be a considerable tonnage of *D. malaccensis* in the United States which has been considered of little value except for agricultural purposes. Since a search of the literature (17 references) revealed very little information on the efficiency of the low rotenone content of the roots in comparison with other rotenone-bearing plants, six separate field tests were conducted against the Mexican bean beetle, imported cabbageworm, cabbage looper, diamondback moth, potato aphid, and European corn borer. In every case the *D. malaccensis* dust equaled or surpassed the 0.5 percent rotenone or the 0.4 percent rotenone plus 2 percent Lethane dusts.

The biology and control of the carrot fly, D. W. Wright, F. R. Petherbridge and D. G. Ashby (*Agriculture, Jour. Min. Agr. [Gt. Brit.], 51 (1944), No. 1, pp. 11–15*).—The carrot rust fly is reported to be widespread in Great Britain and to cause serious damage to carrot crops in both garden and farm. Its life history and control by cultural methods are briefly summarized, and a chemical method recently worked out by the authors and previously reported upon in detail by Petherbridge and Wright (E. S. R., 91, p. 56) is outlined.

Insecticidal uses of tartar emetic: Against onion thrips in New York, W. H. Ewart, T. C. Watkins, and D. Ashdown. (Cornell Univ.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 269–276*).—During the past 5 yr. tartar emetic has proved effective against onion thrips in New York, but in many cases insect populations have been so low that yield increases have not been commensurate with the reductions in number. From the studies thus far it would seem advisable to make 5–6 treatments with tartar emetic-sugar water (2–4–100) spray at about 6-day intervals, beginning when the onions are about 4–6 in. high and applying at the rate of at least 125 gal. per acre at 150-lb. pressure. Use of wetters or spreaders does not appear warranted, but other insecticides (e. g., sodium antimonyl lactophenolate,

sodium antimonyl hydroxyacetate, and pyrethrum) also seem to offer possibilities. The schedule presented is a matter of insurance based on the residual effect, since treatments are made before the thrips have reached damaging proportions; it also permits conclusion before the onions have attained sufficient growth to be severely injured by the sprayer. In view of the cheapness of the materials, the increased value of the onions when injuries are severe, and the normally high value of particular crops such as those raised for seed, this program would appear to be economically sound.

Tomato pinworm control in the greenhouse, L. D. Anderson and H. G. Walker. (Va. Truck Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 264–268*).—In spray tests on greenhouse tomatoes it was found that four applications of either calcium arsenate or cryolite gave a partial but not practical control of the tomato pinworm, whereas two applications of certain pyrethrum and rotenone sprays on tomato and eggplant foliage gave excellent control, actually killing the larvae within the tunnels. In dipping tests in which the larvae were submerged in very weak concentrations of several different pyrethrum and rotenone mixtures it appeared that pyrethrum in a technical mannitan monolaurate mixture was more effective than rotenone similarly dispersed. Also, a preparation containing 2 percent pyrethrins was more effective than one containing 1 percent pyrethrins and 1 percent rotenone. The mannitan monolaurate base for these mixtures killed very few of the larvae. "Extrax" proved equally as effective as the above pyrethrum preparation, whereas several other pyrethrum and pyrethrum-rotenone mixtures were less so. In ovicidal tests, pyrethrum and rotenone mixtures gave practically complete control of the eggs in both dipping and spraying tests. In several of the tests both rotenone and pyrethrum mixtures also gave excellent control of spinach aphids and of all stages of the greenhouse whitefly. In a small field test pyrethrum and rotenone mixtures killed about 65 percent of the potato tuber worm larvae mining in potato foliage.

Studies on the response of fruitflies to temperature, E. W. Baker. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 280–283, illus. 6*).—The major host ranges of the Mexican fruitfly, Mexican *Anastrepha mombinpraeoptans,* and *A. serpentina* Wied. are given. Groups of 50 flies of each sex and species were taken 4–10 hr. after emergence and kept in small cheesecloth cages at temperatures of 10°, 15°, 20°, 25°, 30°, and 35° C., air being circulated in each cabinet container by means of electrically operated fans. Through use of the methods described, it was shown that the Mexican fruitfly lives longer than the other two species at the lower temperatures, that *A. serpentina* is an intermediate species as regards longevity, and that the Mexican *A. mombinpraeoptans* is the shortest lived at the intermediate temperatures.

Laboratory studies on the toxicity of tartar emetic to the Mexican fruitfly, C. C. Plummer (*U. S. Dept. Agr. Cir. 697 (1944), pp. 14, illus. 1*).—Methods for testing the toxicity of tartar emetic with granulated sugar to adults of the Mexican fruitfly at 25° C. are discussed. Mortality records were obtained at approximately equal intervals at the logarithms of the hours from time of starting. The mean length of life of flies from each cage was read directly from the provisional regression line at probit 5.0 (50 percent point). Flies exposed to 4 lb. of tartar emetic and 20 lb. of sugar in 100 gal. of aqueous solution died more rapidly in cages started at 6 a. m. than in those started at either 12 noon, 6 p. m., or 12 p. m., and flies exposed to the same formula died more rapidly in cages with capacities of 178 or 476 cu. in. than in cages with capacities of 1,055 or 1,792 cu. in. When starved for 24 hr. and then allowed food for 3 hr. before exposure to tartar emetic and sugar the flies died more rapidly than those having continuous access to food or those allowed food for either 6 or 12 hr. after a 24-hr. starvation period and previous

to exposure to poison. Four toxicity experiments with 0.125 to 8 lb. of tartar emetic in 100 gal. of solution containing 20 lb. of sugar showed that decrease in length of life was not great as the concentration of tartar emetic was gradually increased from 2 to 6 or 8 lb. When flies were exposed to concentrations of less than 1 lb. toxicity fell off markedly. Tartar emetic proved no more toxic to males than to females.

Oriental fruit moth parasite liberations and surveys, B. F. Driggers. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 235–237*).—In 7-yr. surveys of oriental fruit moth larvae feeding in peach twigs, *Macrocentrus ancylivorus* Rohr. proved to be the most numerous parasite in orchards of central and southern New Jersey. It was not found in the northern part of the State except where artificially introduced, *Glypta rufiscutellaris* Cres. being the dominant parasite there. However, when introduced in northern New Jersey on second-brood fruit moth larvae, *M. ancylivorus* built up on second- and third-brood larvae to become the dominant species during a single season. This parasite wintered over one season but by the end of the second it had practically disappeared; absence of its alternate hosts in the northern part of the State is suggested as one of the reasons for its failure to survive.

Control of apple insects, L. Jenkins (*Missouri Sta. Cir. 291 (1944), pp. 15, illus. 21*).—A practical account.

Codling-moth infestation at different heights in apple trees, A. M. Woodside (*Virginia Sta. Bul. 360 (1944), pp. 10, illus. 1*).—Counts of infested fruits and results of analysis of spray deposits at different heights in trees revealed that tops of many Virginia apple trees do not receive sufficient spray to control worms. In fact, the infestation ran as high in the tops of tall trees in certain sprayed orchards as in fruits in unsprayed orchards. By adequate spray coverage in two orchards codling moth larvae were controlled over the entire tree. Examination of fruit after spraying is the most practical way to determine whether coverage has been adequate. Young trees should be pruned to prevent excessive tallness from the viewpoint of codling moth control.

A comparison of dust and spray programs for codling moth control, S. W Harman. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 208–211*).—This paper presents one part of a larger cooperative endeavor designed to establish the place of dusting in the apple pest control program. Though the results summarized in this preliminary report represent but a single season's work in a moderately infested McIntosh orchard and thus do not warrant far-reaching conclusions, they do suggest that under comparable conditions the adoption of a dusting program for codling moth control, at least under present conditions, may prove both effective and profitable, particularly in view of the existing acute labor shortage. The preparations used were sulfur-lead arsenate and the same plus nicotine as dusts compared with sulfur-lead arsenate as a spray.

The pear thrips in California, S. F. Bailey (*California Sta. Bul. 687 (1944), pp. 55, illus. 33*).—The pear thrips in California is most abundant and injurious on pear, prune, plum, and cherry. In Sonoma, Napa, Solano, and Santa Clara Counties this species is a major pest on pear and prune. Bud injury by adults directly reduces the crop, while scarring of fruit by larvae seriously lowers the quality. Eggs are inserted into the surface of stems, leaves, and fruit, and by petal fall the larvae have hatched. After feeding for about 2 weeks, the larvae drop to the ground and construct a cell in the soil 6–12 in. below the surface. Transformation to adults occurs in October and November. Peak emergence in the spring is usually about March 12. Rainfall, especially dates of rainfall, greatly influence pear thrips abundance.

"Of all the proprietary spray materials tested over the years, rotenone and a poison-bait spray made up of tartar emetic and sugar have given outstanding re-

sults. Rotenone spray powders (especially those to which pyrethrum has been added) should be used at the rate of 2 to 6 lb. per 100 gal. of water, according to the strength of the rotenone. Products containing less than about 0.75 percent rotenone are not practical. The same is true of rotenone dusts, of which not less than 35 lb. should be applied per acre. A spray containing 2 to 4 lb. of tartar emetic and an equal amount of sugar in 100 gal. of water gives excellent control. In general, sprays are more effective than dusts. All sprays and dusts are much more effective in reducing fruit injury and subsequent bud injury if directed against larvae rather than adults."

Currant and gooseberry insects, D. C. MOTE (*Oregon Sta. Cir. 152 (1943), pp. 3–7, illus. 1*).—This is a revision of Circular 42 (E. S. R., 49, p. 555).

A method for evaluating treatments for grape leafhopper and for analyzing the heterogeneity of the infestation, F. Z. HARTZELL and J. L. HORSFALL. (N. Y. State Expt. Sta. et al.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 219–224, illus. 3*).—The method described consists essentially in selecting certain leaves, collecting them, separating the leafhoppers, and determining the total catch by counting the number in an aliquot of the sample. It was shown to be rapid, reasonably accurate, sufficiently simple for use by helpers, adapted to field studies, and to require only inexpensive equipment. The errors from its use appeared to be no greater than those from duplicate samples taken from the same vine and gave very small discrepancies in calculating percentage control, especially where the efficiency was 75 percent or greater. The amount of variation in populations in different parts of the same vineyard was found to be practically as great as between vineyards. The technic described furnishes a quick means of determining the degree of heterogeneity and is believed to be as important for this purpose as for evaluating treatments. It should prove useful in designing experiments.

The avocado insect situation, M. B. ROUNDS. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Soc. Yearbook, 1943, pp. 52–53*).—Avocado tree and fruit insect pests in southern California are said to be largely controlled at present by natural causes. However, pests already established which occasionally cause injury are the brown mite, greenhouse thrips, latania scale, omnivorous looper, and *Amorbia*; these are discussed briefly.

Avocado thrips, J. E. COIT (*Calif. Avocado Soc. Yearbook, 1943, pp. 57–59, illus. 2*).—During 1943 there was widespread complaint about losses in grade of avocado fruit through injury by the greenhouse thrips. This note briefly summarizes the life history of the pest and methods of control and lists its more common host plants. Illustrations are presented of carapace or wind scar, a condition not to be confused with thrips injury.

The effect of some insecticides in aerosol form against the cyclamen mite on snapdragon, L. D. GOODHUE and F. F. SMITH. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 213–218, illus. 1*).—In preliminary tests of 32 insecticides in aerosol form against this snapdragon pest in a 216-cu. ft. Peet-Grady chamber, lorol thiocyanate was most promising. It was further tried out in a practical way in the greenhouse and, finally, a series of tests was run to show the effect of treatments at weekly intervals. Complete control of the mite was obtained by two weekly treatments with 73.7 gm. of a methyl chloride solution containing 10.8 gm. lorol thiocyanate per 1,000 cu. ft. of space. As a dispersing agent, methyl chloride appeared slightly superior to dichlorodifluoromethane. With two treatments no plant injury occurred, but further applications caused growth changes characterized by elongated internodes and narrowed leaves.

The effect of methyl bromide fumigation on the subsequent development of the Croft lily, E. P. BREAKEY. (Wash. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 277–279, illus. 6*).—Selected bulbs of the Croft variety of Easter

lily were fumigated with methyl bromide at various schedules to determine its influence on subsequent plant growth and development; in general, the effect was that of stimulation. The higher schedules proved injurious; the lower ones, beneficial. Bulbs at 70° F. subjected to 2 lb. methyl bromide per 1,000 cu. ft. for 2, 2.5, or 3 hr. or to 3 lb. for 2 hr.were definitely benefited. A schedule of 2 lb. for 2.5 hr. gave optimum results as based on subsequent growth and development of the lilies.

The insect menace to shade trees in the Northeast, E. P. Felt and S. W. Bromley (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 212–213*).—A plea for more attention—in spite of the demands of war—to the insects, diseases, and injuries by drought and winter temperatures of trees, with particular reference to the insect menace to elms and oaks and to the pitch pine on Cape Cod, Mass.

Seasonal changes in reaction of coniferous evergreens to methyl bromide fumigations, R. Latta and A. C. Johnson. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 261–263*).—Tests of seven varieties of coniferous nursery plants in Virginia, Maryland, and Delaware for their tolerance to the methyl bromide fumigations employed against Japanese beetle larvae showed a definite relationship in six of them between the extent of injury and the season when treated. Those fumigated during late winter, when apparently least active, exhibited no foliage injury, but severe damage resulted when they were treated during late March and April as they were breaking dormancy. Though the amount of foliage injury from spring fumigation differed for each variety, the same trend was apparent in all six varieties. The seventh variety, Colorado spruce, was severely injured in all tests, but in this case the dormant period had probably ended before initiation of the tests. Japanese yew and Goldplume Sawara false cypress were selected for fumigation tests between August 1941 and May 1942 at Beltsville, Md.; in this series a tolerant period was evident between December and February, preceded and followed by periods where foliage injury occurred. The period in all these tests not followed by foliage injury coincided with the least activity of the plants. Since the period of lowered tolerance in both fall and spring tests occurred at the time of normal nursery stock movement, it is believed that injury to commercial stock from fumigation has been due to the plants being in a relatively active state. Fumigation of coniferous evergreens in accordance with Japanese beetle quarantine schedules is thus considered inadvisable except where open weather conditions permit their treatment during the period of least activity or where specific varieties have been tested sufficiently to establish their reactions to fumigation at various seasons of the year.

Controlling bagworm on evergreens, L. Haseman (*Missouri Sta. Cir. 287 (1944), pp. [2], illus. 1*).—A practical account.

Population studies of the European spruce sawfly in Maine as affected by natural enemies, G. O. Dirks. (Univ. Maine). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 238–242, illus. 1*).—During 1935–40, *Gilpinia hercyniae* Htg. threatened severe injury to spruce forests in Maine, reaching a high level of population about 1939; during 1941-43 it rapidly declined. Over the years of this study a number of important rodent and insect predators have been observed to attack as much as 20–50 percent of the cocoons of this sawfly, but they seldom appeared to constitute a check at times when epidemics were imminent. When established and with favorable conditions, *Microplectron fuscipennis*—introduced from Europe—proved capable of a high percentage of parasitism of the cocoons; when spun in deep litter and moss, however, they were not parasitized as often as those near the surface. A wilt disease of the sawfly was widespread in Maine (1940-42) and frequently caused a high degree of mortality to the larvae; this infection was generally prevalent in areas of both high and low populations of the larvae and appeared to have been an important factor in the decline of the sawfly.

Studies on a species of Liposcelis (Corrodentia: Liposcelidae) occurring in stored products in Britain, I, E. Broadhead and B. M. Hobby (*Ent. Mo. Mag., 4. ser., 5 (1944), No. 50, pp. 45–48, illus. 13*).—*L. granicola* n. sp., described and illustrated, is believed to have been introduced into Great Britain with various foodstuffs. Hitherto, 26 reputed species and named forms of this genus have been recorded. Few of these are mentioned subsequently in the literature; they are briefly referred to here.

The effects of infrared radiation on certain insects, S. W. Frost, L. E Dills, and J. E. Nicholas. (Pa. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 287–290, illus. 3*).—Since infrared rays may have a practical application in controlling certain insects—especially those infesting stored grains—a number of observations were made by the authors, the purpose being to determine the lethal exposure and if possible the cause of death. These tests, using methods described in detail, were made particularly on the larvae and adults of the confused flour beetle and the yellow mealworm, though a few were run with other insect species. The minimum lethal exposure for the confused flour beetle at 5-in. distance proved to be 30 sec., with little difference in resistance between larvae and adults. For the mealworm, on the other hand, there was a well-marked difference, the larvae requiring 14 sec. and the adults 8–9 sec. at 5-in. distance; two factors that may explain the difference were the darker color and consequent greater heat absorptive power of the adults and the more heavily sclerotized body wall which would retain the absorbed energy better. It appeared from these results that death from infrared irradiation is due to the increased body temperature. A temperature of 82.2° C. is considered the maximum safe exposure for drying wheat without injury to its milling and baking qualities. A few preliminary tests with the confused flour beetle gave no kill when they were covered with ¼ in. of wheat flour. There is no doubt that sufficiently high temperatures can be induced in grain insects by infrared irradiation to cause death; the problem lies in finding a satisfactory means of treating infested grain.

Research tests on soil-poisoning chemicals for the control of subterranean termites, I. Hatfield (*Pests, 12 (1944), No. 3, pp. 10–14, illus. 8*).—The information presented concerns the methods of testing soil-poison chemicals and the data obtained on both termites and chemicals over a 5-yr. period of experimentation. It is concluded from analysis of the results that valuable new compounds will ultimately be available for use as soil poisons against these pests. However, the currently used pentachlorophenol and its mixture with trichlorobenzene are among the best treatments studied. For the time being and to the extent that they may be available, these materials are recommended on the basis of their value as here confirmed.

Control of termites, L. Haseman (*Missouri Sta. Bul. 478 (1944), pp. 15, illus. 8*).—A practical account.

The action of bean leaves against the bedbug, H. H. Richardson. (U. S. D. A.). (*Pests, 12 (1944), No. 3, pp. 29–30, 31, illus. 3*).—In an attempt to determine why bean leaves are used in Balkan countries for trapping the bedbug, specimens of the latter were confined with bean leaves overnight in the laboratory. According to the results, these leaves have no attractant action but do serve as traps in that the insect's legs become entangled in the small hooked hairs present on both surfaces of the leaves. Seed pods of the common weed tick trefoil exerted a similar action, but other types of foliage not provided with hooked hairs gave negative results.

Tests of repellents against chiggers, A. H. Madden, A. W. Lindquist, and E. F. Knipling. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 283–286*).—This investigation at Orlando, Fla, included studies on the relative

effectiveness of powders, liquids, and ointments applied to the skin and of liquids applied to the clothing. The last method proved most effective and gave the longest protection, even when test subjects were seated or lying on the ground in heavily infested areas. The most practical means of treating clothing was to apply the liquid repellents from a small-mouth bottle in a ½-in. band around the inside of the waist, fly, and bottoms of the legs of the trousers, the cuffs, fly, and neck of the shirt, and in a wide band around the upper part of the socks. Clothing treated in this way with dimethyl phthalate, Indalone, or Rutgers 612 gave good protection up to 30 days after treatment. For practical reasons, including the greater desirability for use, cheapness, and availability, dimethyl phthalate is considered the best repellent for the purpose.

The breeding of the salt-marsh mosquito in Midwestern States, H. L. Fellton (*Jour. Econ. Ent., 37 (1944), No. 2, pp. 245–247*).—This mosquito—common on the East coast—was found breeding abundantly in and near Evansville, Ind., and near Centralia and Dupo, Ill., and at all these places in areas intermittently flooded with salt water from swimming pools or oil wells. In one case larvae were taken from a pond into which the acid waste from a shaft coal mine flowed.

Contributions of the Bureau of Entomology and Plant Quarantine of the Department of Agriculture to the national program for the control of malaria, F. C. Bishopp. (U. S. D. A.). (*Jour. Natl. Malaria Soc., 3 (1944), No. 1, pp. 45–54*)—A brief historical summary (18 references) of some of the more important entomological contributions of this Federal bureau over the years, including surveys and investigations with regard to taxonomy, insecticides, sprays, aerosols in mosquito control and repellents.

Reconocimiento de paludismo en Cuba [Survey of malaria in Cuba], H. P. Carr, R. B. Hill, J. Fernandez Melendez, A. Ros, and A. Fernandez Melendez (*Salubridad y Asistencia Social [Cuba], 46 (1943), No. 7–12, pp. 67–137, illus. 6*).—This comprehensive survey (with 15 references) includes consideration of the five anopheline mosquitoes encountered in Cuba (*Anopheles albimanus, A. crucians, A. grabhamii, A. vestitipennis, and A. atropos*). *A. albimanus* is the most prevalent species and is believed to be the principal vector in Cuba. *A. crucians* has been recovered with spontaneous infection and probably transmits malaria in certain areas near the coast, and *A. vestitipennis* may be an occasional vector. As far as this investigation goes, the other species appeared to be without importance.

Ecologia do Anopheles gambiae: Pesquisas preliminares sôbre a viabilidade dos ovos que ficam fora da água [Ecology of A. gambiae: Preliminary study of the viability of the eggs without access to water], G. M. de Oliveira Castro (*Mem. Inst. Oswaldo Cruz, 38 (1943), No. 3, pp. 517–534, illus. 1; Eng. abs., p. 534*).

Observations on the breeding of Anopheles (Anopheles) claviger Meigen, R. A. Davies (*Jour. Trop. Med. and Hyg. [London], 46 (1943–44), No. 6, pp. 71–76, illus. 6*).—A technic is described for obtaining the fertile eggs of this mosquito in the laboratory, and the rate of development of the species at different temperatures is discussed. A brief account is also given of the external morphology of the insect as it occurred in wells near the author's laboratory (Mediterranean coastal area of Lebanon).

Infecção espontânea e experimental de hematófagos (ixodídeos, triatomídeos, culicídeos, hirudíneos, pediculídeos e cimicídeos) em leprosos—possibilidade de serem eles vectores ou transmissores da lepra [Spontaneous and experimental infection of hematophagous ticks and insects on lepers—possibility of their becoming vectors of leprosy], H. C. de Scuza-Araujo (*Mem. Inst. Oswaldo Cruz, 38* (1943), *No. 3, pp. 447–484, illus. 21*; *Eng. abs., p. 482*).

Novo transmissor silvestre do "Trypanosoma (Schizotrypanum) cruzi" (Chagas, 1909) [A new wild vector of T. cruzi], F. Nery Guimarães and G. Jansen (*Mem. Inst. Oswaldo Cruz, 38 (1943), No. 3, pp. 437–441, illus. 6; Eng. abs., pp. 440–441*).—In opossum nests in palm trees the author found a new species of reduviid bug (see following entry) spontaneously infected with *T. cruzi*—cause of Chagas' disease. Two guinea pigs were infected by peritoneal inoculation of feces of this insect. Evidence was also obtained that this opossum (*Didelphis aurita*) is one of the reservoirs of this disease, several specimens having been found infected and one carrying trypanosomes in the peripheral blood.

Novo transmissor da doença de Chagas na cidade do Rio de Janeiro, D. F. estudo dos gêneros Belminus Stal 1859, Bolbodera Valdés 1910, e descrição de Parabelminus carioca n. g., n. sp. (Hemiptera: Triatomidae) [A new vector of Chagas' disease in the city of Rio de Janeiro, together with a study of the genera Belminus and Bolbodera and a description of P. carioca n. gen. and sp.], H. Lent (*Mem. Inst. Oswaldo Cruz, 38 (1943), No. 3, pp. 497–516, illus. 10*).—*P. carioca* n. gen and sp.—the new reduviid vector of Chagas' disease—is described in detail and illustrated.

A new subfamily of beetles parasitic on mammals (Staphylinidae: Amblyopininae), C. H. Seevers (*Field Mus. Nat. Hist. [Chicago] Pub., Zool. Ser., 28 (1944), No. 3, pp. 155–172+, illus. 24*).—It has been known for over 70 yr. that certain South American rodents and marsupials harbor curious ectoparasitic staphylinid beetles, yet surprisingly little is known about them in spite of this unusual mode of life for beetles. The new subfamily Amblyopininae is set up to include the group, and a key is provided to the eight species of *Amblyopinus*, including three here described as new.

Eine neue Methode der Bekämpfung der Fliegenplagen in Ställen [A new method of controlling flies in stables], R. Wiesmann (*Anz. Schädlingsk., 19 (1943), No. 1, pp. 5–8*).—It is concluded from the experiments reported that Gesarol is an effective means of controlling the fly pest in stables. Two applications of the spray—once early in June and once early in August—are said to have effectively banished the fly plague from stables where used. It is believed probable that this pesticide would also prove satisfactory for other sanitary uses where fly control is important.

Fly control in stables: Use of "Gesarol" or the new "DDT" in the control of stable flies, R. Weismann (*Soap and Sanit. Chem., 19 (1944), No. 12, pp. 117, 119, 141, 143*).—A translation by C. Zeimet of the paper noted above.

Cattle grubs and their control, B. Schwartz. (U. S. D. A.). (*Vet. Med., 39 (1944), No. 4, pp. 162–166, illus. 6*).—In this address the author summarizes present knowledge on the life histories of the two species—common cattle grub and northern cattle grub—occurring in the United States, the injuries produced, and on measures of control and eradication.

The eradication of the brown dog tick (Rhipicephalus sanguineus Ltr.) from a dog kennel, W. O. Neitz (*Jour. So. African Vet. Med. Assoc., 14 (1943), No. 3, pp. 90–93, illus. 1*).—The numerous diseases of man and animals transmissible by the brown dog tick are tabulated, and a practical and economical method of eradicating it with a pyagra-oil-paraffin preparation is described.

Associação entre Mallophaga e Hippoboscidae [Association between Mallophaga and Hippoboscidae], C. R. Hathaway (*Mem. Inst. Oswaldo Cruz, 38 (1943), No. 3, pp. 413–417, illus. 2*).—A note on bird lice parasitizing members of the louse fly group, accompanied by an annotated chronological tabulation of some 40 reported cases of louse flies (*Ornithomyia, Ornithoeca, Pseudolynchia, Lynchia, Ornitheza*) carrying bird lice, including the bird hosts and localities.

Comparative external morphology, phylogeny, and a classification of the bees (Hymenoptera), C. D. MICHENER (*Bul. Amer. Mus. Nat. Hist., 82 (1944), Art. 6, pp. 151–326, illus. 259*).

The effects of some insecticidal and fungicidal dusts on bees, F. R. SHAW and A. I. BOURNE. (Mass. State Col.). (*Gleanings Bee Cult., 72 (1944), No. 4, p. 125*).—Five materials were tested in 1943—a corn borer dust containing 1 percent rotenone and one containing 4 percent nicotine, a pyrethrum dust containing a 4-percent petroleum solution of pyrethrins, a 300-mesh sulfur dust, and a dinitrophenol dust used primarily in the summer application against the European red mite. The first three caused heavy mortality, though the nicotine dust was slower in action. The sulfur dust gave a 100 percent kill in 10 days. The dinitro dust did not appear to offer any serious problem to bees.

ANIMAL PRODUCTION

The conservation of alfalfa and timothy nutrients as silages and as hays, III, O. M. CAMBURN, H. B. ELLENBERGER, C. H. JONES, and G. C. CROOKS (*Vermont Sta. Bul. 509 (1944), pp. 32*).—In continuing previous studies (E. S. R., 89, p. 468) of the conservation of forage nutrients by ensiling, the dry matter content of alfalfa as ensiled with and without preservatives ranged from 28 to 42 percent, timothy from 34 to 42 percent, and late-cut timothy from 28 to 37 percent. In small silos the dry-matter losses were, respectively, 26, 28, 25, and 32 percent without preservative, with molasses, with phosphoric acid, and with A. I. V. solution, averaging 28 percent more than would have been the case in a 36-ft. silo. In sun-cured hay from standing grass to hay cured in the mow, there was a loss of nutrients of 20, 11, and 12 percent for alfalfa, timothy, and late-cut timothy, respectively. The losses were less in artificially dried hays—9, 3, and 10 percent, respectively. In general, hays and silages from the same crop were similar in nutrient composition. With ideal weather, sun curing was an efficient method of conserving grass nutrients. The nutrients other than fat were somewhat more digestible in hay than in silage. Molasses nutrients added for preservation in excess of those needed for acid formation were well conserved. The original grass carotene was better retained in artificially dried than in sun-cured hay. The amounts of carotene retained in sun-cured hay after 1, 2, and 3 years' storage were, respectively, 14, 9, and 6 percent as contrasted with 31, 31, and 14 percent in artificially dried hay. The tests were conducted in 12 small wooden silos 4 by 12 ft. and 3 large silos 10 by 24 ft. The alfalfa was cut at the one-fourth- to three-fourths-bloom stage, the timothy at one-fourth- to one-half-bloom stage, and the late-cut timothy at full bloom. Different amounts of the preservatives from 0 to 10 percent molasses or about 1 percent phosphoric acid were added to the sun-wilted grasses. Losses were determined by changes in the composition of the materials placed in bags in silos or in the mow. Digestibility of the hays and silages were determined with dairy cows and 2-year-old heifers by methods outlined (E. S. R., 79, p. 522; 83, p. 667), with preliminary periods lasting 10 days for silage and 14 days for hays, followed by two consecutive 5-day collection periods.

The use of urea in making silage from sweet sorghum, A. E. CULLISON. (Miss. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 59-62*).—As Harris and Mitchell (E. S. R., 86, p. 77) found that the digestibility of a low-protein ration could be improved by supplementing it with urea, study was made of the effect when urea was sprinkled on freshly cut sweet sorghum at the rate of 10 lb. per ton as it entered the silo. This silage was compared with untreated silage for wintering 2 lots of 15 Hereford and Angus cows each. There was no change in weight in 78 days by the lot receiving a daily ration of 5 lb. Johnson grass hay and 35 lb.

urea-treated sorghum silage, but another lot lost an average of 47 lb. on a ration of untreated silage and hay. The urea-treated silage was also distinctly superior to untreated silage in palatability and was eaten in preference to hay, which was preferred to untreated silage. Urea-treated silage, after approximately 4-mo. storage, contained 34.55γ of carotene per gram of dry matter as contrasted with 22.67γ of carotene per gram for untreated silage. Six weeks later the silages contained 35.96γ and 15.71γ of carotene per gram of dry matter, respectively. The subsurface temperature of untreated silage after several months indicated that fermentation was still going on, but no fermentation was noticeable in urea-treated silage. There appeared to be distinct benefit from the addition of urea to the sorghum silage.

Proteins for livestock and poultry, E. A. Trowbridge, A. C. Ragsdale, and H. L. Kempster (*Missouri Sta. Cir. 286 (1944), pp. 4*).—Pasture and hay from legumes are suggested as partial aids for protein needs by beef and dairy cattle, swine, sheep, horses, and poultry.

Minerals for farm animals, J. R. Haag (*Oregon Sta. Cir. 153 (1943), pp. 11*).—The calcium and phosphorus contents of various feeds are presented, and a description is given of the function of the essential minerals in animal physiology.

Feed utilization tests with cattle, H. R. Guilbert and P. W. Gregory. (Univ. Calif.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 143–153, illus. 3*).—Feed utilization tests were conducted on 10 steer calves from each of 4 sires fed a standard ration of rolled barley, molasses, beet pulp, cottonseed meal, and alfalfa hay, according to appetite, and marketed when the steers attained a definite finish. Conformation variations ascertained by measurements, grading, and carcass data were recorded. The steers were fed to an equal degree of fatness. Lots having the same rate of gain differed significantly in economy of gain, and likewise lots having the same economy of gain differed in rate of gain, indicating that rate of gain was not a satisfactory index of economy of gain in groups differing in potential mature size and earliness of maturity. Relative rate of gain and relative feed capacity were highly correlated with efficiency of feed utilization. Some of the difficulties encountered in an accurate index for individual animals are mentioned. "The conclusion is reached that with suitable refinements the technic employed in these tests permits the determination of differences in efficiency of feed utilization between get of sire groups with reasonable accuracy."

Some factors affecting the blood phosphorus level of range ewes, W. M. Beeson, C. E. Terrill, and D. W. Bolin. (Idaho Expt. Sta. and U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 175-182, illus.* 1).—The blood phosphorus levels from about 40 Columbia ewes of the U. S. D. A. Sheep Experiment Station, Dubois, Idaho, over a 4-yr. period showed the highest average blood phosphorus content to be on the winter range in the latter part of January, followed by a decrease in the feed lot to the lowest level at lambing time. A high blood phosphorus was again found on the spring range in June. Significant variations between years were found for the winter range, at the end of the winter feeding periods, at lambing time, and in November on the fall range. Supplemental feeding of cottonseed cake or oats in the winter appeared to increase the blood phosphorus. When ⅓ lb. of cottonseed cake was fed for a 3-week period on winter range, the average inorganic phosphorus content of the blood was 6.08 mg. per 100 cc. of plasma as compared with 5.60 mg. when no supplement was fed. When ½ lb. of oats was fed per day with winter feed, the phosphorus content of the blood averaged 4.88 mg. as contrasted with 4.25 mg. without oats. Dry ewes had higher blood phosphorus than ewes that were pregnant or were nursing lambs. Ewes with one lamb had higher blood phosphorus than ewes with two lambs. Blood phosphorus decreased with age. Ewes which were losing weight had higher blood phosporus than those which were gaining. In the group there was no definite evidence of phosphorus deficiency except

low blood phosphorus levels. Blood samples were taken at the general seasonal intervals—when ewes came off the fall range, off the winter range, during the winter feed-lot period, during the lambing period, off the spring range, and off the summer range.

Clean-wool yields in small samples from eight body regions as related to whole-fleece yields in four breeds of sheep, E. M. POHLE and L. N. HAZEL. (U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 159–165*).—Samples of clean wool taken from 8 body regions of 15 yearling ewes of each of the Rambouillet, Targhee, Corriedale, and Columbia breeds were correlated with the whole-fleece yields. The gradient in yield for the different body regions was similar for the 4 breeds to that reported by Pohle et al. for Rambouillets (E. S. R., 89, p. 720). The average bone-dry clean-wool predictions were highest from shoulder, hip, thigh, and belly, with yields of 46.6, 47.2, 47.9, and 46.1 percent, respectively. The average clean-wool yield of the whole fleece was 38.6 percent for the 4 breeds. The difference between the average small-sample and whole-fleece yield of 3.4 percent, and differences between breeds, proved highly significant. Differences among sheep within breeds were also highly significant. "The *a* and *b* coefficients (with small-sample yield as the dependent variable) were similar for the 4 breeds but not for the 8 regions. Thus the most accurate coefficients for predicting whole-fleece yields seem to be the *a* and *b* values for a particular region averaged for the 4 breeds." The lowest correlations were between the withers, back, and rump, with the whole fleece. However, there was little difference in accuracy or predictions from the shoulder, side, hip, thigh, and belly samples.

A preliminary report on the post-natal development of the fiber characteristics of the fleeces of Navajo sheep, J. O. GRANDSTAFF and C. T. BLUNN. (U. S. D. A. et al.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 194–200, illus. 2*).—A study of the fiber characteristics of 15 Navajo lambs at periodic intervals of growth up to 1 yr. of age showed that at 28 days of growth the samples consisted of 60 percent wool, 24 percent hair, and 15 percent kemp by count. During the next 56 days the wool fibers increased 21 percent and the hair and kemp fibers decreased 9.5 and 10.5 percent, respectively. After 84 days the relative proportions remained relatively constant. Differences were greatest between lambs at 28 days, but decreased rapidly up to 84 days and to a very limited extent thereafter, which suggests the influence of genetic factors. Highly significant differences in the percentages of wool, kemp, and hair between sheep, positions, and ages were indicated. The diameter distribution of wool and hair fibers did not change significantly during the year, but significant changes in the diameter of kemp fibers were shown between 28 and 56 days.

Shearing did not speed lamb fattening gains, P. S. JORDAN and W. H. PETERS (*Minn. Farm and Home Sci.* [*Minnesota Sta.*], *1 (1944), No. 3, p. 15, illus. 2*).—In a fattening test of 78 days' duration, shearing before or during the fattening period or not shearing at all had no significant effect on the rate of gain or the feed required. In a 97-day test in which lambs were shorn 48 days before marketing, about 50 ct. more per head was obtained when the wool and lamb were separately marketed than for the lambs marketed unshorn.

Lambs say new linseed meal is equal to old, P. S. JORDAN and W. H. PETERS, (*Minn. Farm and Home Sci.* [*Minnesota Sta.*], *1 (1944), No. 3, p. 7*).—In an 82-day fattening period with 8 lots of 30 lambs each, extracted, solvent, and pressed linseed meal proved equal for lambs receiving corn and prairie hay.

Growth and development, with special reference to domestic animals.—LIX, Resting energy metabolism and pulmonary ventilation in growing swine, S. BRODY and H. H. KIBLER (*Missouri Sta. Res. Bul. 380 (1944), pp. 20, illus. 6*).—In continuation of this series (E. S. R., 89, p. 577), "data are presented in tabular

('prediction table') and graphic form for pulmonary ventilation and 'resting' energy metabolism (oxygen consumption and equivalent values in Calories, B. t. u., and TDN during rest but not in post-absorptive condition) in relation to body weight and age in growing swine. The 'resting' metabolism data are compared with data on the same animals obtained following 24-hr. fasting and with data on basal metabolism of mature animals of different species. The pulmonary ventilation rate in growing swine increases with the 0.63 power of body weight. The resting oxygen consumption (minimum maintenance energy cost under customary farm conditions) varies with the 0.90 power of body weight from birth to puberty (7 mo. of age), and with approximately the two-thirds power of body weight thereafter. When plotted in terms of Calories per square meter of surface area, the resting metabolism of swine rises from about 1,300 Cal./m.²/day during the first month to 2,300–2,400 at 7 mo., then declines to 1,300–1,600 at 24 mo., depending on sex. The 24-hr. fasting metabolism rises from 1,000 Cal./m.²/day during the first month to 1,600 at 8 mo., then declines to near 1,000 Cal./m.²/day at 24 mo. The males have a consistently higher fasting metabolism than the females. Critical discussions are presented of the physiologic and practical significance of 'basal' and 'resting' metabolism, of the peculiar age changes in metabolism, and of pulmonary ventilation. These results should be of interest to students of energy metabolism, comparative physiology, nutrition, growth, to ventilating and air-conditioning engineers, and also to livestock feeders as the data are also presented in terms of maintenance cost for various live weights and ages." The data include heat production and oxygen consumption during growth of male and female Duroc Jersey and Chester White breeds.

The development of body form in swine, R. E. Comstock and L. M. Winters. (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 188-193*).—Variances between the 170 coefficients of proportional regression of boar and barrow measurements (E. S. R., 87, p. 210) were studied statistically. The boars and barrows followed different paths of development with respect to conformation, the difference being greater in the Minnesota No. 1 line. As animals increased in size, body form changes and most of the relative growth constants were larger or smaller than 1. There were genetic differences in the course of change in form since breed differences, and in one instance line differences, in relative growth constants were demonstrated. It is suggested that swine improvement measured in terms of economically important characteristics would be more rapid if conformation were considered only at market weight and attention to type at other ages were shifted to performance.

Distillers' by-products in swine rations, I, II. (Univ. Ill.). (*Jour. Anim. Sci., 3 (1944), Nos. 1, pp. 29–40, illus. 1; 2, pp. 107–119, illus. 1*).

I. *Creep-feeding and growing-fattening rations,* B. W. Fairbanks, J. L. Krider, and W. E. Carroll.—A basal ration of ground yellow corn, wheat flour middlings, soybean meal, tankage, fish meal, minerals, and fortified cod-liver oil was compared with the basal ration supplemented with 6 percent dried corn distillers' solubles and with the basal ration plus 12 percent corn distillers' grains with solubles as to the gains produced up to 50 lb. live weight, from 50 to 100 lb., and 100 to 225 lb. live weight. No significant differences in gains were produced up to weaning; 0.37, 0.35, and 0.40 lb. for the average daily gain on the basal rations, or with 6 percent dried corn distillers' solubles or 12 percent corn distillers' dried grains with solubles, respectively. The pigs failed to thrive normally from 50 to 100 lb. live weight in dry lot on the basal ration, although the ration contained about 20 percent protein, vitamins A and D in fortified cod-liver oil, and more than the minimum requirement of riboflavin, niacin, and pantothenic acid. Evidently other factors known or unknown may exist and were supplied by the distillers' byproducts, and the gains were improved. The study was conducted with 6 lots of about 20 pigs each, of

which from 6 to 10 pigs died during the test, due in part to persistent scouring. The study covered pigs of 18 sows divided into groups and creep-fed the three rations from farrowing to weaning. After weaning the pigs were again divided so one group received the basal ration only and the other was supplemented with one of the distillers' byproducts. The best average daily gain, 1.28 lb., was made from weaning to marketing by a group receiving the basal ration plus 6 percent dried corn distillers' solubles. Average daily gains of 1.03, 1.02, and 0.75 lb., respectively, were produced during this period on the basal ration only by groups receiving the basal ration or the basal ration plus 6 percent dried corn distillers' solubles or 12 percent corn distillers' dried grains with solubles.

II. *Lactation and growing-fattening rations,* J. L. Krider, B. W. Fairbanks, and W. E. Carroll.—Fortification of a basal ration of yellow corn, tankage, soybean meal, alfalfa meal, and minerals with 6 percent dried corn distillers' solubles did not result in any important measurable difference in either pigs or sows up to weaning. After weaning, a basal ration of ground yellow corn, wheat flour middlings, soybean meal, tankage, fish meal, fortfied cod-liver oil, and minerals was nutritionally inadequate, but gains were improved by supplementing with dried corn distillers' solubles or alfalfa meal—improvement which was attributed to the water-soluble vitamins in these products. Additions of alfalfa meal produced as rapid growth as 6 percent dried corn distillers' solubles but not as rapid growth as 12 percent distillers' solubles. Alfalfa meal at the level of 8 percent was a more adequate supplement in promoting normal development of the feet and legs than 6 percent corn distillers' solubles, but these were comparable in promoting thriftiness of the skin and hair. The pigs from sows fed a fortified ration during lactation manifested a residual effect of the higher nutrition, as shown by the better survival on the basal fattening ration. "Goose-stepping" pigs resulted from degeneration of the femoral and sciatic nerves characterized by incomplete demyelination. The results of the study suggest "(1) the growing-fattening pigs require more of the known vitamins than the literature indicates, (2) the basal ration is deficient in other known or unknown factors, (3) the methods of vitamin assay for riboflavin, niacin, and pantothenic acid are in need of greater refinement, or (4) the limiting vitamin or vitamins supplied in the basal ration are not as available to the pig as the synthetic vitamins when fed as supplements to a purified diet." The study was initiated with 20 sows and their litters on the basal ration and an equal number with the supplement of 6 percent corn solubles, with the pigs further fortified after weaning.

Studies with swine on low-manganese rations of natural foodstuffs, S. R. Johnson. (Ark. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 136–142*).—Pigs were grown at satisfactory rates from weaning to slaughter weights on rations of natural feedstuffs containing 7–10 p. p. m. of Mn. When the ash content of the rations was increased to above 10 percent there appeared to be a slight beneficial effect from additions of Mn, though the ratio of the medium ash content which was not supplemented with Mn was the most satisfactory of those used. Reproduction was satisfactory through two generations on a ration of corn and skim milk with vitamin D added. Mn storage in the liver on rations of natural feedstuffs of low-Mn content was greater than that previously found on a low-Mn ration (E. S. R., 89, p. 106), but less than found on a high-Mn ration. The study was conducted with pigs on rations of corn meal and skim milk, with additions of varying amounts of yeast, dehydrated alfalfa meal, skim-milk powder, meat scrap, tankage, and minerals. The rations varied in ash on oven-dry basis from 1.77 to 13.41 percent and in Mn from 7.47 to 228.68 p. p. m.

The B vitamin requirements of the horse, P. B. Pearson, M. K. Sheybani, and H. Schmidt. (Tex. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 166–174, illus. 3*).—Rations of beet pulp, corn, purified casein, minerals, and vita-

mins A and D did not support growth in Shetland ponies, but satisfactory gains were made when 10 percent yeast was added to such a ration; 5 percent yeast was inadequate. Rice straw was a fairly good source of riboflavin and pantothenic acid. The addition of rice straw promoted satisfactory gains. When the basal ration was supplemented with synthetic riboflavin and pantothenic acid, essentially as good growth was obtained as with 10 percent yeast. A ration containing 0.35 mg. of riboflavin per 100 gm. was adequate for normal growth of horses. This was equivalent to an intake of approximately 44 mg. of riboflavin per kilogram of body weight per day. The study was conducted over approximately 3 yr. with two groups of six horses each with rations assayed for riboflavin, niacin, and calcium pantothenate.

Care and management of baby chicks, W. C. THOMPSON (*New Jersey Stas. Cir. 474 (1944), pp. 24, illus. 13*).—A revision of Circular 400 (E. S. R., 83, p. 390).

Fused rock phosphate for chicks, E. S. MCCONNELL, W. M. INSKO, JR., and G. D. BUCKNER (*Kentucky Sta. Bul. 455 (1944), pp. 4*).—In two experiments of 8 weeks' duration, comparison was made of the growth of chicks receiving different forms of phosphate as supplements to an all-mash ration consisting largely of vegetable feeds. Fused rock phosphates containing 0.01 and 0.3 percent fluorine were equal to steamed bone meal as phosphorus supplements for growing chicks. Raw rock phosphate containing 3.49 percent fluorine fed as 3 percent of the ration decreased the feed consumption and retarded growth. The results with calcium metaphosphate as a supplement were not consistent in that the average weights at 8 weeks of age were about as large as those produced with any of the phosphorus supplements, but the ash in the fat-free dry bone was the lowest for any of the groups except for those which received no phosphorus supplement. In the first experiment, there were 5 lots of 60 chicks each, and in the second, 6 lots of 44 chicks.

Soybean oil meal in the broiler ration, C. I. DRAPER and R. J. EVANS (*Washington Sta. V Cir. 19 (1944), pp. 4, illus. 1*).—Rations containing 0, 14.6, 26.2, and 31 percent soybean meal were fed to 10 weeks of age to 4 duplicate lots of 20 cockerels each. The 2 lots without soybean meal but with protein supplements of 13.7 percent herring fish meal attained an average weight of 3.01 lb. The lots receiving 6.7 percent fish meal and 14.6 percent soybean meal made practically equal gains, averaging in final weight 2.99 lb., but the gain on a ration with 26.2 percent soybean meal resulted in an average final weight of 2.51 lb. and that with 31 percent soybean meal to an average of 2.72 lb. The greatest gain on the least feed consumed was made with the ration of herring fish meal plus dry skim milk. The cockerels all feathered satisfactorily, and the inclusion of 31 percent soybean meal in the ration did not cause loose droppings.

Influence of light on age at sexual maturity and ovulation rate of pullets, E. W. CALLENBACH, J. E. NICHOLAS, and R. R. MURPHY (*Pennsylvania Sta. Bul. 461 (1944), pp. 12, illus. 1*).—Study of growth, egg production, and feed consumption of 8 lots of 160 day-old Single-Comb White Leghorn chicks each, subjected to different conditions of lighting from hatching on June 23 to the end of the experiment on January 18, showed that 24-hour-per-day illumination during the growing period did not result in sexual maturity at a younger age. The groups were set up so that two were exposed to daylight only and two had 24-hr. illumination by a 40-w. Mazda lamp from dusk to dawn. Two groups had 24-hr. illumination through growth until sexual maturity, with normal daylight for 4 weeks thereafter, followed by 24-hours-per-day lighting until the end of the experiment. In two other groups daylight only was provided to sexual maturity, followed by 24-hr. lighting. Pullets lighted during growth or subjected to reduced lighting for 4 weeks at sexual maturity showed the greatest response to artificial lighting during production. Constant lighting during the growing period appeared to inhibit the expression of sexual maturity and prevented a high rate of production. Growth, feed

consumption, and mortality were either unaffected by the light treatments or indirectly influenced by egg production. Not only was constant illumination of no value in the management of late-hatched pullets, but its application prior to sexual maturity was detrimental. It was found that the best time for the application of supplemental illumination when daylight is decreased is when pullets are of an age usual for first egg production of spring-hatched chicks.

Light intensity as a factor in the artificial illumination of pullets, J. E. NICHOLAS, E. W. CALLENBACH, and R. R. MURPHY (*Pennsylvania Sta. Bul. 462 (1944), pp. 24, illus. 10*).—Carrying further the studies of the effects of lighting on egg production, mortality, and health (E. S. R., 90, p. 675), 3 years' experiments of 20 weeks' each during the short-day months with Single-Comb White Leghorn and Barred Plymouth Rock pullets subjected to different intensities of light, varying from 0.5 to 38 footcandles at a central point in the "working area" and from 0 to 27 footcandles at a central point on the roosting perches showed that there was no significant influence of these different intensities of light on egg production. The lowered mash consumption in the White Leghorn pens which did not receive supplementary light was solely responsible. There was no correlation between the light intensity and egg weight or mortality. The study was conducted the first year with 8 lots of 48 Single-Comb White Leghorn pullets, the second year with 8 lots of 46 Barred Plymouth Rocks, and the third year again with 8 lots of 48 Single-Comb White Leghorns. The lots were managed in duplicate each year with 2 lots receiving daylight only and 2 receiving 15-w. fluorescent lamps from 3:45 to 8 a.m. In other duplicate lots additional light was furnished by one 15-w., one 40-w., and one 100-w. Mazda lamps or two 20-w. and eight 30-w. fluorescent daylight lamps.

The effect of substituting vegetable protein for meat protein in a ration for growing turkeys, F. B. HEADLEY (*Nevada Sta. Bul. 168 (1944), pp. 7, illus. 1*).—Feeding a low meat mash containing less than 10 percent animal protein to poults to 8 weeks of age significantly lessened the rate of gain as compared with another group of poults brooded on a ration of 25.8 percent protein of which 47 percent was of animal origin. The 2 groups of 72 poults each averaged 3.01 and 2.26 lb., respectively, at 8 weeks of age. The birds from the high and low protein rations were subdivided into 3 groups grown on high, medium, and low meat mashes with wheat. Differences in early growth did not persist through the growing period. Evidently soybean meal could be substituted for fish or meat meal, so that the percentage of animal protein constitutes 12 percent of the total protein without reduction in rate of growth. The animal protein might also be further reduced to about 5 percent of the total protein without materially decreasing growth rate or unfavorably affecting feed required per unit of gain. Toms and hens were fed separately.

The care of homing pigeons, C. S. PLATT and R. S. DARE (*New Jersey Stas. Hints to Poultrymen, 31 (1944), No. 3, pp. [4], illus. 2*).—General directions for the management of homing pigeons, including rations which gave about equal results.

DAIRY FARMING—DAIRYING

A dairy action program for Missouri, including the dairy industry 8-point program for 1944 and 1945 (*Missouri Sta. Cir. 283 (1944), pp. 55*).—This circular presents the following brief popular papers: General Objective for Dairying in Missouri (pp. 1–3), and Dairy Rations—Making Use of Available Feeds—New Facts About Simplified Rations (pp. 18–21), both by A. C. Ragsdale; The Agricultural Outlook As It May Affect 1944 Milk Production in Missouri, by G. B. Nance (pp. 3–5); Our 1944 Feed Supply, by J. E. Crosby (pp. 5–6); Pasture, Hay, and

Silage Crops for Dairy Cattle, by J. R. Paulling (pp. 6–7); Harvesting and Preserving Crops for Silage (pp. 7–11), Factors Influencing the Quality and Nutritive Value of Roughages (pp. 11–18), A Planned Breeding Program—Sires—Artificial Breeding (pp. 24–28), Keeping the Herd Healthy—Reduce Calf Losses—A Sanitation Program (pp. 29–32), and Herd Records for the Dairy Farmer (pp. 32–35), all by H. A. Herman; Feeding Springing Heifers and Dry Cows, by M. J. Regan (pp. 21–23); Fitting the Dairy Program to the Individual Farm, by M. J. Regan and B. H. Frame (pp. 23–24); Rapid Milking, by C. W. Turner (pp. 28–29); Herd Replacement Problems, by E. T. Itschner (pp. 35–37); Why Quality Milk and Milk Products Are Important (pp. 37–38), Minimum Standards for Cream Stations (pp. 47–49), and The Dairy Industry Transportation Program of Missouri (pp. 53–54), all by W. H. E. Reid; Producing Quality Milk and Cream—Essentials (pp. 39–41), Selection and Grading of Milk at the Plant Intake (pp. 44–46), Cleaning the Milking Machine (pp. 49–50), and Washing the Cream Separator in Two Minutes (pp. 50–51), all by E. R. Garrison; Why Milk and Cream Tests Vary, by E. W. Swanson (pp. 41–44); and Farm-to-Market Transportation of Milk, by H. M. Haag (pp. 51–52).

Experiments on the use of home grown foods for milk production, I, II, K. L. Blaxter (*Jour. Agr. Sci. [England], 34 (1944), No. 1, pp. 22–26; 27–34, illus. 1*).—Two experiments are reported in this series:

I. *The effect of war-time changes in the food supply on the nutrient intake and milk production of dairy cows.*—In studies using five pairs of comparable dairy cows in the first lactation, it was found that a ration high in dry matter, brought about by the inclusion of straw, tends to be less readily consumed and there is less milk production than by rations low in dry matter. It was concluded that the dry matter consumption was not an adequate method of expressing the amount of feed that a cow will consume. The major factor influencing feed consumption was palatability.

II. *The effect of feeding concentrated and bulky foods prior to calving on subsequent milk production.*—In experiments at 6 farms with 51 cows and heifers, feeding an average of 156 lb. of concentrates produced 7 lb. more milk per day and the cows were in better condition than controls. Greater gains in live weight were produced by cows on the more bulky and higher dry-matter-content feeds, but they did not calve in such good condition and milk production was only 3 lb. per day less than the controls. The weights of the calves and cows showed a correlation of +0.507, but there was no correlation between the weight of the calf and the treatment which the cow received. The farmer's judgment on the condition of the cow at calving was closely related to the cow's subsequent performance.

Peppergrass silage, A. D. Pratt. (Va. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 5, pp. 365–367*).—Peppergrass (*Lepidium virginicum*) was ensiled with molasses and found to produce a palatable silage that had no peppergrass flavor, and none was noted in the milk or butter produced by four cows. After fermentation in the silo, the seeds did not germinate.

The digestibility of Korean lespedeza hay and ground Korean lespedeza seed for dairy heifers, E. W. Swanson and H. A. Herman. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 263–268*).—The digestibility of Korean lespedeza hay at three stages of maturity and Korean lespedeza seed was ascertained with four Holstein-Friesian heifers 18-20 mo. of age, in continuation of studies of lespedeza for milk production (E. S. R., 88, p. 380). Lespedeza hay does not decrease in protein content with advancing maturity, but lignification is quite marked as the hay is made from the crop as it matures and the seed has increased fiber due to the hulls. The digestibility of the crude protein of lespedeza seed averaged 81.35 percent. The seed contained an average of 69.01 percent total digestible nu-

trients and had a nutritive ratio of 1 : 1.22. Analyses of the feeds and feces of four heifers, collected in 10-day periods following a 10-day preliminary period, are reported. Hays made from lespedeza cut well in advance of bloom, just before bloom, and after bloom, and third-cutting alfalfa were employed.

Effect of adding cod liver oil to the rations of dairy calves, T. W. Gullickson and J. B. Fitch. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 5, pp. 331–335*).—Roughly one-half of the 72 calves born in the Guernsey, Holstein, and Jersey herds at University Farm, Minn., in a 3-yr. period were fed about 25-35 cc. of cod-liver oil per head daily in addition to milk and grain. Weights were determined at 10-day intervals, and height of withers was ascertained every 30 days. Adding cod-liver oil had no evident effect on the rate of gain in height at withers of calves of these breeds or in gain in weight of Holsteins. On the other hand, the Guernsey and Jersey calves fed cod-liver oil gained 22.5 and 17.5 lb., respectively, more per calf during the 180-day period than calves receiving no cod-liver oil. Somewhat less digestive troubles were noted in the calves fed cod-liver oil than in the nonsupplemented groups.

Maryland University Holstein herd shows rapid progress, K. L. Turk (*Holstein-Friesian World, 41 (1944), No. 9, pp. 22, 82, illus. 3*).—The increase from 7,265 lb. milk and 248.6 lb. fat in 1936-37 to 12,892 lb. milk and 471.9 lb. fat in 1940–41 as the average production of the herd is noted. There was a slight decrease in 1941–42, partly restored in 1942-43.

Good feeding makes for efficient performance, W. E. Krauss. (Ohio Expt. Sta.). (*Guernsey Breeders' Jour., 65 (1944), No. 9, 774–775, 782, illus. 1*).—A general discussion of the need of dairy cattle for minerals and vitamins for efficient milk production.

The effect of feeding cottonseed meal as the only concentrate on several properties of milk, I–IV, P. G. Miller and G. H. Wise. (S. C. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 275–279, illus. 1; pp. 281–286, illus. 2; pp. 287–291, illus. 2; pp. 293–296, illus. 1*).—The effects of a ration consisting of cottonseed meal as the sole concentrate on the composition of the milk produced was investigated in a series of four experiments. Comparison was made with the composition of the milk produced by cows receiving a concentrate mixture of 400 lb. corn gluten meal, 200 lb. wheat bran, 200 lb. ground corn, and 200 lb. ground oats. The roughage of corn and soybean silage or pasture was the same for the 2 groups of 8-10 cows fed with and without cottonseed meal for the 16-mo. determinations.

I. *Fat, total solids, and ash content.*—During 4 mo. there was no difference in the fat and total solids content of the milk, but thereafter the milk from the cows with the cottonseed meal began to have a lower fat and total solids content. The solids-not-fat content of the milk from the two groups follows the same trend as the total solids and fat. When the cows were turned on pasture there was a drop in the ash content of the milk.

II. *Nitrogen distribution.*—The milk from the cottonseed-meal-fed group had a higher nonprotein nitrogen content than that from the control group, but there was no apparent difference in the noncasein protein nitrogen content. After about 4 mo. the group receiving cottonseed meal produced milk of a lower casein nitrogen content than the other group. The comparatively lower casein nitrogen was accompanied by a lower fat and total solids content in such a ratio that the casein nitrogen as percentage of total solids was the same for both groups. The milk from the two groups of cows was dependent on the relative levels of nonprotein and casein nitrogen. Thus the total nitrogen was first higher, then lower, in milk from the cottonseed meal group. The two groups of cows produced essentially the same quantities of milk.

III. *pH rennet coagulation, heat coagulation, and curd tension.*—Differences in pH, rennet coagulation, heat coagulation, and curd tension of milks from these cows followed the same general trends as differences in the composition. The milk from the cottonseed meal group had a higher pH than that from the control group. This difference increased as the difference in total solids increased. After about 5 months' feeding, milk from the cottonseed-meal-fed cattle required longer to coagulate by rennet than that from the controls. Feeding cottonseed meal may create a problem in heat stabilization.

IV. *Fat constants.*—The saponification number was decreased and the iodine number and refractive index of the milk fat increased as a result of cottonseed meal feeding. The expected decrease in the Reichert-Meissl number was not evident until after 9 mo. of the feeding period had passed. The milk from cottonseed-meal-fed cows was less stable toward oxidation than normal milk. There was no difference in the acid degree of milk fats.

Effect of feeding silages on certain properties of milk.—I, Effect on the yellow color and flavor of winter milk. II, Influence on the vitamin A content and distribution of carotenoid pigments in milk fat. III, Effect of various storage conditions on the stability of carotenoid pigments in butter, O. F. Garrett and D. K. Bosshardt (*New Jersey Stas. Bul. 710 (1944), pp. 30, illus. 1*).—The effects of feeding alfalfa, green oat, and soybean silages on the color and flavor and the distribution and storage of carotenoid pigments in the milk of Holstein and Guernsey cows were investigated in 3 years' experiments. There were three groups of three Holstein and two Guernsey cows each, fed each year on a preliminary ration for 1 week followed by a 21-week experimental period with corn silage, molasses-alfalfa silage, and phosphoric acid-alfalfa silage in the three groups. During the first year two alfalfa silages preserved with molasses and phosphoric acid were studied, in the second year two green oat silages preserved with molasses and phosphoric acid were compared, and in the third year comparison was made of soybean silage preserved with molasses and soybean silage preserved with corn meal. There was a gradual decrease in the concentration of yellow color of the milk produced on corn silage for about 6 weeks, but after this period the yellow color was maintained rather evenly. The yellow color and fat content of the milk from groups on the molasses- and phosphoric acid-alfalfa silages gradually increased, but the yellow color was higher with phosphoric acid-alfalfa silage than with molasses-alfalfa silage. It is evident in these tests that yellow color and fat content do not necessarily go together. The flavor of the milk produced on both types of alfalfa silage was better when fresh and after 72 hours' storage than that produced by cows receiving corn silage. Milk produced on the alfalfa silage was less susceptible to the development of oxidized flavor when stored for 72 hr. with the additions of 1.3 p. p. m. of copper. Corn silage was slightly superior to the oat silages in increasing the color of the milk. Milk produced on the oat silages was slightly superior when fresh and and after 72 hours' storage to that produced on corn silage. Differences in the development of oxidized flavor in copper-treated milk produced with these silages were probably due to the individual differences in cows rather than to feeds. Milk produced by cows fed soybean silage and corn silage lost color and flavor slightly when fresh and after storage for 48 and 90 hr.

In the second of these papers, "eight bands, or zones, of carotenoid pigments were chromatographically isolated from corn silage, molasses-soybean silage, and corn meal-soybean silage and from the milk fats produced on these roughages. Only seven bands were found in pasture grass and the milk fat produced therefrom. The observation of others that the cow is capable of selecting β-carotene from among the various plant carotenoids and concentrating it in the milk fat is verified by the results of these studies. Milk produced on soybean silages contained approximately the

same amount of total carotenoid pigment, carotene, and vitamin A as milk produced on corn silage." Breed differences in the vitamin A and carotene relationships between Holstein and Guernsey milk were noted.

In the third paper, chemical studies showed that the carotenoid pigments of milk fat were not entirely stable. α-Carotene was least stable and β-carotene most stable of the identified pigments. The destruction of β-carotene was accelerated by the presence of copper, but it had little influence on α-carotene and xanthophyll. A definite retardation of the oxidative degradation of β-carotene was exhibited by hydroquinone both with and without added cupric ions. Undoubtedly the pigments in bands IIIa, IIIb, and IV are degradation of α- and β-carotene.

The effect of iodinated casein (Protamone) on milk and butterfat production and on the ascorbic acid content of the milk, A. H. Van Landingham, H. O. Henderson, and C. E. Weakley, Jr. (W. Va. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 5, pp. 385–396, illus. 6*).—Iodinated casein (Protamone) was fed by the double reversal method to two groups of three cows each in declining lactation during a 13-week period. An increase of 5–20 percent in milk production and 25–50 percent in butterfat production was associated with feeding 15 gm. of iodinated casein per day. The fat content of the milk was increased by 0.47–0.98 percent during the first 4 weeks' feeding of the iodinated casein. With its omission for 4 weeks the fat content decreased, but when it was again restored for a second 4 weeks' period the fat content was increased by 0.90–2.03 percent above that of the milk at the begininng of the experiment. Chemical analyses showed that the solids-not-fat content of the milk slightly increased and the ascorbic acid decreased about 33 percent as a result of the iodinated casein supplement. There was an increase in respiration and pulse rate of the cows, and a small decrease in body weight.

Certain relationships of avitaminosis A to vitamin C in the young bovine, P. D. Boyer, P. H. Phillips, W. D. Pounden, C. W. Jensen, I. W. Rupel, and M. E. Nesbit. (*Wis. Expt. Sta.*). (*Jour. Nutr., 23 (1942), No. 5, pp. 525-531*).—In a study of the relation between the blood levels of vitamin A and C and the effects of avitaminosis A on urinary vitamin C excretion, observations were made on 8 Holstein and 3 Guernsey calves maintained for 5–8 mo. on the basal vitamin A-deficient ration or this ration supplemented with either crystalline carotene in cottonseed oil or vitamin A as shark-liver oil. These supplements were fed in amounts equivalent to 0–100 μg. and 0–18 μg., respectively, per kilogram of body weight per day. The level of blood plasma ascorbic acid seems contingent on the level of vitamin A in the dairy calf, particularly when the vitamin A level falls below 0.10 μg. per cubic centimeter. Vitamin A pathology occurred only after the blood plasma levels of vitamin A decreased to a low level of 0.05–0.07 μg. or less and remained there for several weeks. A marked decrease in the ascorbic acid content of the cerebrospinal fluid was found in the calves suffering from vitamin A deficiency, and an increased intracranial pressure was observed. The vitamin C content of the cerebrospinal fluid in the cow was normally from 5 to 10 times that of the blood plasma. The administration of vitamin C to A-deficient calves caused a rise in the C content of the cerebrospinal fluid and a lowering of the pressure. The decrease in the vitamin C excretion of the vitamin A-deficient rat indicates that the lowered blood and tissue vitamin C is the result of impaired synthesis.

Further studies on oxidation of vitamin A and carotene in milk fat, V. N. Krukovsky, G. H. Ellis, and B. W. Barnes. (Cornell Univ. and U. S. D. A.). (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 249–255, illus. 3*).—The resistance of vitamin A and carotene to oxidation (E. S. R., 91, p. 189) by redispersing the fat in pasteurized skim milk decreased on exposure of the fat to light or after prolonged storage in the dark. Milk fat was stored for several months even at 60° C. without loss of vitamin A if the fat was degasified and placed in a light-proof container filled

to the top and tightly sealed. Rapid precooling as contrasted with slow cooling retarded the destruction of vitamin A and carotene during storage at 5° and 20° in open-air but protected-from-the-light containers. Milk fat containing free fatty acids or which was irradiated showed increased losses of vitamin A and carotene.

Loss of riboflavin in milk due to sunlight. O. E. Stamberg and D. R. Theophilus. (Idaho Expt. Sta.). (*Milk Dealer, 33 (1944), No. 8, pp. 32, 42*).—Milk containing 1.74 mg. of riboflavin per liter was shown to lose this vitamin rapidly in the presence of light and at the higher temperatures. In clear bottles at 41° F. with direct sunlight, raw or pasteurized milk lost nearly half of the riboflavin within 2 hr. From 70 to 80 percent was lost with direct sunlight exposure for 6 hr. Only about 10 percent of the riboflavin was lost in good shade or in brown bottles in 4 to 6 hr. even at 70°. The percentage of riboflavin lost with Jersey milk was less than with the lower vitamin Holstein milk, although the actual amount lost in Jersey milk was greater.

The riddle of bitter milk, B. L. Harrington and V. N. Krukovsky (*Canad. Dairy and Ice Cream Jour., 23 (1944), No. 3, pp. 45, 53*).—The greater prevalence of bitter flavor in milk in the winter is noted.

Mastitis—laboratory tests and their interpretation, J. M. Frayer. (Vt. Expt. Sta.). (*Jour. Milk Technol., 7 (1944), No. 2, pp. 89-97*).—A review is presented of the strip-cup test, bromothymol-blue test, modified Whiteside test, catalase test, chlorine test, Hotis test, and physical examination of the cow and microscopic examination of the milk for the presence of mastitis.

Influence of homogenization on the properties of milk and cream, J. L. Henderson. (Univ. Calif.). (*Milk Dealer, 33 (1944), No. 8, pp. 30, 76, 78*).—Homogenization of milk was shown to decrease creaming, increase viscosity in milk with over 6 percent fat, increase rancidity and some flavors, decrease oxidized flavor, lower curd tension, make color whiter, and decrease protein stability.

A study of cream rising in milk, F. M. Skelton and H. H. Sommer. (S. Dak. State Col. and Univ. Wis.). (*Jour. Dairy Sci., 27 (1944), No. 5, pp. 321–330, illus. 2*).—Studies of the cream rising from samples of raw and pasteurized milk in 1, 2, 4, 6, 10, and 24 hr. in 1,000-cc. cylinders at 40° F. showed that the greatest portion of the fat rises during the first hour, but it continues to rise slowly even as long as 24 hr. later. There appeared to be no difference in the way the cream layer forms in raw and pasteurized milk. The fat content of the skim milk at one level may be slightly less than the fat content of the skim milk at a lower level. The study was conducted in five experiments, one with raw and four with pasteurized milk, with analyses made at different levels and at the six periods.

The viability of certain udder infection bacteria in butter made from raw cream, C. S. and P. S. Bryan. (Mich. Expt. Sta.). (*Jour. Milk Technol., 7 (1944), No. 2, pp. 65-67*).—The milk from different quarters of an udder artificially inoculated with *Streptococcus agalactiae, S. pyogenes,* a nonhemolytic strain of *Staphylococcus aureus,* and a hemolytic strain of this organism was allowed to separate by gravity. A broth culture of *Brucella abortus* was added to 1 week's supply of cream. All the pathogens were present in the raw samples, but they were destroyed by pasteurizing the cream for 30 min. at 145° F. *B. abortus* remained viable for 4 mo. in butter from raw sweet cream and in butter made from cream ripened 6 and 12 days. The pathogenic streptococci remained viable for 6 mo. in fresh and salted butter made from the unpasteurized cream. Pasteurization in a double boiler by methods of Trout et al. (E. S. R., 90, p. 244) also proved effective in freeing the cream and butter of pathogens.

A new quantitative method for estimation of total combined length of mold fragments in butter, P. R. Elliker. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 5, pp. 369-375*).—A method for estimating the combined length of

dead mold fragments per gram or milligram of butter was developed. In this method, 1 gm. of butter was diluted in a hot gum solution. A small quantity was spread on a glass slide and examined under low power after staining. The average length of the mold filament per field was multiplied by the microscope factor divided by 1,000. The results are reported in millimeters per milligram of butter. The method has been of use in studies of the total mold fragment content of butter, buttermilk, wash water, and cream.

Bacteriology of cheese.—VII, Calcium and phosphate contents of various cheeses, including relationship to bacterial action in the manufacturing procedures, H. J. Zahrndt, C. B. Lane, and B. W. Hammer (*Iowa Sta. Res. Bul. 325 (1944), pp. 141–158, illus. 1*).—Continuing this series (E. S. R., 86, p. 380), the Ca and P contents and the Ca : P ratios of 52 samples of Cheddar, 27 of Swiss, 9 of Edam, 7 of blue-veined, 6 of cottage, 3 of cream cheese, and 6 miscellaneous types showed that the Ca and P were higher in the Swiss and Edam cheeses than in the other types. Cheddar cheese was next highest, with blue-veined cheese, cottage cheese, and cream cheese conspicuously lower. Differences in the Ca content were definitely greater than differences in the P content. The variations found in the several types of cheese were what would be expected with the manufacturing processes. There was no relation of the Ca and P content to state of origin or flavor of the cheese. Regular Swiss cheese tended to be higher in Ca and P than pasteurized Swiss.

The relation of chlorine and catalase content of milk to its curd tension, E. G. Hastings and A. Erekson. (Wis. Expt. Sta. et al.). (*Jour. Dairy Sci., 27 (1944), No. 5, pp. 337-343*).—Study was made of the curd tension and the catalase and chlorine contents and resazurin reduction tests of monthly samples of milk from 6 herds including a total of 157 cows. The milk of 1 herd had an average curd tension approximately twice as great as that of the other 5 herds and represented what would be expected from a group of cows with healthy udders. The low curd tension of 4 of the remaining 5 herds is believed to be due to the high incidence of chronic mastitis. Since the milk therefrom was abnormally high in catalase and chlorine, the low curd tension of the milk of the other herds seemed to be due to the genetic pattern of the cows in the herd with chlorine and catalase abnormally high. Wide variations in the curd tension, catalase and chlorine contents, and reduction tests make these of little value for ascertaining quality of the milk.

The viscosity of evaporated milks of different solids concentration, E. F. Deysher, B. H. Webb, and G. E. Holm. (U. S. D. A.). (*Jour. Dairy Sci., 27 (1944), No. 5, pp. 345–355, illus. 6*).—The viscosity of evaporated milk was shown to pass through well-defined changes as a result of manufacturing processes and storage conditions—first a thickening with the heat of sterilization, followed by thinning during early storage, and finally the possibility of its increasing after long periods of storage until a gel has formed. In the conduct of the study, all milk was standardized to a fat to solids-not-fat ratio of 1 : 2.29, with normal- and high-temperature forewarming (E. S. R., 90, p. 91). The milk was concentrated to 32–35 percent solids at 60° C., homogenized at a pressure of 2,500 lb. per square inch, and cooled. Heat stability was ascertained. Viscosity was measured with a McMichael viscosimeter. The viscosities at coagulation decreased as the heat stabilities of the milk increased. The initial loss in body was retarded by low storage temperature. Samples held 55 days at 16° had the same viscosity as those held 5 days at 25°. Aging fresh milk before evaporation lowered the viscosity of the evaporated product by its effect on heat stability, but aging in storage did not appear to influence viscosity. Fat separation in evaporated milk suggested that cases in storage should be turned at regular intervals—approximately every 6 weeks. The viscosity may be increased by raising the milk solids content.

Wheat germ oil as an antioxidant in dairy products, P. H. Tracy, W. A. Hoskisson, and J. M. Trimble. (Univ. Ill. et al.) (*Jour. Dairy Sci., 27 (1944), No. 4, pp. 311–318*).—"The ability of wheat-germ oil to prevent oxidation has been determined in fluid milk, frozen cream, and powdered whole milk made by both the vacuum roll and spray processes. The amount of wheat-germ oil needed for best results is approximately 0.2 percent of the weight of the fat. At higher levels (0.3 percent) the flavor of the oil is sometimes detectable. Wheat-germ oil reinforced with citric acid was found to be more effective in retarding oxidation in milk powder than regular oil. While wheat-germ oil is not as effective as gas packing with nitrogen in preventing the development of the oxidized flavor in powdered milk, a combination of the two will prolong the shelf life of the powder more than either one alone will accomplish."

VETERINARY MEDICINE

The American illustrated medical dictionary, W. A. N. Dorland (*Philadelphia: W. B. Saunders Co., 1944, 20. ed., rev. and enl., pp. 1668, illus. 885*).—This is the twentieth edition of what is termed "a complete dictionary of the terms used in medicine, surgery, dentistry, pharmacy, chemistry, nursing, veterinary science, biology, medical biography, etc."

Animal pathology, R. A. Runnells (*Ames, Iowa: Collegiate Press, 1944, 3. ed., pp. 594+, illus. 184*).—This is an enlargement and revision of the treatise previously noted (E. S. R., 80, p. 680).

[Contributions on animal pathology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 17 (1941), No. 1–2, pp. 7–50, 181–296, illus. 21*).—Among those included are the following: Treatment and Control of Chronic Streptococcus Mastitis in Bovines—Results Obtained in Two Herds, by S. W. J. Van Rensburg and J. A. Thorburn (pp. 7–50); South African *Senecio* Alkaloids—VI, The Toxic Alkaloids of *Senecio sceleratus* sp. nov. Schweikerdt, by H. L. de Waal and T. P. Pretorius (pp. 181–190) (E. S. R., 87, p. 851); The Hydrocyanic Acid Content of *Cynodon plectostachyum* Pilger (Giant Star Grass) and Its Suitability as a Pasture Grass (pp. 191–199), Poisoning by Voided Urine (pp. 201–206), Poisoning by Spent Calcium Carbide (pp. 207–210), and Recent Investigations Into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, XII (pp. 211–223) (E. S. R., 87, p. 851), all by S. J. van der Walt and D. G. Steyn; and Domsiekte or Pregnancy Disease in Sheep, I, by J. W. Groenewald, H. Graf, and R. Clark (pp. 225–244) and II, by J. Groenewald, H. Graf, P. W. Bekker, J. R. Malan, and R. Clark (pp. 245–296), noted on page 469.

The use of sulfa drugs in veterinary practice, W. R. Krill. (Ohio State Univ.). (*Vet. Med., 39 (1944), No. 6, pp. 243–248*).—The drugs considered in this discussion are sulfanilamide, sulfathiazole, sulfapyridine, sulfadiazine, sulfasuxidine, sulfaguanidine, and sulfamerazine.

Stilboestrol in veterinary practice, W. M. Brancker (*Vet. Rec., 55 (1943), No. 48, pp. 461–462*).—On the basis of her experience, the author points out the need for additional knowledge but suggests that "of the recent discoveries in veterinary practice, that of stilboestrol ranks only second in importance to that of the sulfonamide group."

Vitamin E deficiency in rats given succinyl sulfathiazole in purified diets, F. S. Daft, K. M. Endicott, L. L. Ashburn, and W. H. Sebrell (*Soc. Expt. Biol. and Med. Proc., 53 (1943), No. 2, pp. 130–131*).—It is concluded from these studies that "hyalinization, necrosis, and calcification of voluntary muscle occur in rats given succinyl sulfathiazole in certain purified diets. These lesions may be prevented by the oral administration of α-tocopherol."

Ineffectiveness of sodium succinate in control of duration of barbiturate anesthesia, H. A. Lardy, R. G. Hansen, and P. H. Phillips. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 4, pp. 277–278*).—The intramuscular administration of sodium succinate to fasted rats under pentobarbital or amytal anesthesia did not significantly shorten the duration of the anesthesia. Similarly the intraperitoneal administration of succinate or malate to a limited number of fed rats under pentobarbital anesthesia did not significantly influence the duration of anesthesia.

Experiments on the mode of action of hexyl resorcinol as an anthelmintic, A. R. Trim (*Parasitology, 35 (1944), No. 4, pp. 209–219, illus. 9*).—Using *Ascaris lumbricoides suis* obtained under the same conditions and from the same sources as described by Baldwin (E. S. R., 90, p. 247), the path and rate of penetration of hexyl resorcinol were studied. It was found that the rate of penetration is roughly proportional to the concentration of the drug in the medium and is not significantly affected by changes of pH or oxygen tension and the presence of a number of other substances, including other drugs and certain nutrient substances. It is greatly decreased by gastric mucin and certain concentrations of bile salts and soaps and is increased by certain concentrations of sodium oleate.

Microbiological aspects of penicillin.—VI, Procedure for the cup assay for penicillin, J. W. Foster and H. B. Woodruff (*Jour. Bact., 47 (1944), No. 1, pp. 43–58, illus. 5*).—In connection with previous articles in this series (E. S. R., 90, p. 523), complete details of the cup assay for penicillin are described, including discussions of the principles involved.

The use of the developing chick embryo as a method of testing the antibacterial effectiveness of wound disinfectants, T. W. Green and J. M. Birkeland. (Ohio State Univ.). (*Jour. Infect. Diseases, 74 (1944), No. 1, pp. 32–36*).—A method for determining the antibacterial action of disinfectants by the use of the infected chorioallantoic membrane of the developing chick embryo is described. Data obtained by this method are presented which indicate that "a new class of disinfectants, the cationic detergents, are superior to the mercurials, halogens, and phenol in their antistaphylococcal action."

Avocado leaves dangerous food for livestock, J. E. Coit (*Calif. Avocado Soc. Yearbook, 1943, p. 37*).—A note by L. M. Hurt is given reporting a marked nonbacterial mastitis in goats, cattle, and rabbits following the ingestion of avocado leaves. Goats have usually died, while the cows, although losing their milk, often recover after good nursing.

The toxicity of Glottidium vesicarium (Jacq.) Harper for cattle, M. W. Emmel. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 805, pp. 222, 223*).—Continuing observations by the author on fowls (E. S. R., 73, p. 689) and by Boughton and Hardy on sheep (E. S. R., 81, p. 843), two steers receiving ground immature and mature seeds, respectively, were fatally poisoned by large dosages. The immature seeds were considerably more toxic than the mature seeds.

The chronic oral toxicity of selenium, O. G. Fitzhugh, A. A. Nelson, and C. I. Bliss (*Jour. Pharmacol. and Expt. Ther., 80 (1944), No. 3, pp. 289–299, illus. 1*).—Rats fed selenium in a grain diet at concentrations of 3, 5, 7, 10, 20, and 40 p. p. m. showed toxic effects at all levels of selenium. Selenium at the concentration of 10 p. p. m., or more, with the exception of the 10 p. p. m. from the selenide, killed most of the animals within the first 8 weeks. Lower concentrations of selenium produced chronic symptoms which included a decreased growth rate, a restriction of food consumption, and slight to severe pathological lesions. Selenium at the concentration of 10 p. p. m. from the selenide was about half as toxic as the same concentration from wheat and corn. The outstanding pathological lesion was

cirrhosis of the liver, seen in over 70 percent of the rats surviving more than 3 mo. Among 43 cirrhotic rats surviving 18 mo. or longer, hepatic cell tumors developed in 11 and marked adenomatoid hyperplasia in 4 others. Rats dying during the first 3 mo. showed a subacute type of liver damage. Lesions in viscera other than the liver were not characteristic or extensive. Female rats were more susceptible to selenium than male rats. Rats from different litters on the same dosage of selenium showed a significant difference in growth rates.

The action of detergents on staphylococcal infections of the chorio-allantois of the chick embryo, T. W. Green. (Ohio State Univ.). (*Jour. Infect. Diseases, 74 (1944), No. 1, pp. 37–40*).—Staphylococcal infections of the chorio-allantoic membrane of the developing chick embryo have been used in a survey of the anti-staphylococcal action of cationic and anionic detergents. The results of this survey showed that the cationic agents are much superior to the anionic compounds in their action on staphylococcal infected tissue. Within the cationic group, compounds of all degrees of therapeutic effectiveness have been found, some of them highly active and others completely inactive. Replacement of the chloride or bromide ion by the iodide ion in several compounds resulted in a lower degree of therapeutic activity. "Because several compounds, very similar in structure and degree of germicidal action, exhibited great differences in effectiveness in the egg, it is concluded that the degree of germicidal action of a compound is not a sound basis for prediction of relative therapeutic effectiveness even within such a restricted group as the cationic detergents. The utility of the infected chick embryo as an adjunct in the evaluation of disinfectants is well demonstrated by these experiments."

Variability of Theiler's virus of mouse encephalomyelitis, C. W. Jungeblut (*Science, 99 (1944), No. 2578, pp. 434–435*).—Rapid passage in mice of Theiler's virus of mouse encephalomyelitis was found to induce, on certain occasions, a variation of the infectious agent. The most characteristic feature of this variation is an enhancement in the power of the virus to invade the central nervous system from peripheral channels of infection. The phenomenon apparently is aided by previous contact of virus with certain normal serums. Available serological evidence indicates that the invasive strain is antigenically identical with the noninvasive present strain.

Natural resistance and susceptibility to Russian spring-summer encephalitis in mice, J. Casals and H. A. Schneider (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 2, pp. 201–202; also in Rockefeller Inst. Med. Res. Studies, 125 (1944), pp. 127–129*).—Strains of mice selectively bred for susceptibility and resistance to louping ill and St. Louis encephalitis viruses proved to be similarly susceptible and resistant to subcutaneous or intracerebral inoculation of Russian spring-summer encephalitis virus.

Relationship of the virus of louping ill in sheep and the virus of Russian spring-summer encephalitis in man, J. Casals and L. T. Webster (*Jour. Expt. Med. 79 (1944), No. 1, pp. 45–63; also in Rockefeller Inst. Med. Res. Studies, 125 (1944), pp. 131–149*).—A close relationship is described between the viruses of these two diseases, and they are considered identical. No such similarities were found with other central nervous system viruses.

Attempts to transmit leucaemia of man and of mice to the chick embryo and to the young chick by the amniotic and intravenous routes, J. B. Thiersch (*Austral. Jour. Expt. Biol. and Med. Sci., 22 (1944), No. 1, pp. 57–61, illus. 2*).—In these experiments "leucosis did not develop in the chick embryo, young chick, or adult fowl following the inoculation of the chick embryo with human leukemic material using the amniotic or intravenous route. An osteopathia hyperostotica scleroticans multiplex infantilis developed in 5 fowls out of 12 which hatched after they were inoculated intravenously with human material from chronic leukemias on

the eleventh day of their embryonic life. Human material from acute leukemias inoculated into the 11-day-old chick embryo in a small proportion of cases produced in the lungs early lesions similar to those in influenza virus infection. This lesion is not regarded as specific. Leucosis did not develop in the young chick or adult fowl after intravenous injection of the young chick on the first and seventh day of life with human material from chronic and acute cases of leukemia. Mouse leukemia (AK strain, J. J. Furth) produced no leukemia after inoculation into the same AK strain of mice after 3 chick-embryo passages when the amniotic route was used. Material from an acute case of human leukemia produced lesions in the lung of the chick embryo but did not produce a leukemic reaction in AK strain of mice after a chick-embryo passage."

An outbreak of psittacosis in pigeons, involving the production of inclusion bodies, and transfer of the disease to man, J. E. Smadel, M. J. Wall, and A. Gregg (*Jour. Expt. Med., 78 (1943), No. 3, pp. 189–204; also in Rockefeller Inst. Med. Res. Studies, 125 (1944), pp. 301–316, illus. 10*).—An epizootic disease in pigeons associated with atypical pneumonia in two persons handling the birds has been studied. The outbreak was peculiar in that tissues of the diseased pigeons contained many intranuclear inclusions and that the viruses isolated from these birds produced both intranuclear inclusions and elementary bodies in the cytoplasm of cells of chorioallantoic membranes of the developing egg. "Whether the pigeons were simultaneously infected with two viruses or whether the virus of pigeon psittacosis can produce intranuclear inclusions under certain conditions remains to be determined."

The occurrence of Salmonella types in Australia, I, N. Atkinson and G. M. Woodroofe (*Austral. Jour. Expt. Biol. and Med. Sci., 22 (1944), No. 1, pp. 51–55*).—This article includes a table to show the incidence of Salmonellas so far described in Australia.

A new Salmonella type, Salmonella carrau, with special reference to the 1,7 · · · phases of the Kauffmann-White classification, E. Hormaeche, C. A. Peluffo, and V. Ricaud de Pereyra (*Jour. Bact., 47 (1944), No. 4, pp. 323–326*).—This new type has been found in the feces and blood of human beings, in normal pigs, and was once isolated from flies.

Epidemiology of a maltose fermenting variant of Salmonella pullorum, W. R. Hinshaw, E. McNeil, and T. J. Taylor. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 2, pp. 94–100*).—Continuing the work reported by Hinshaw, Browne, and Taylor (E. S. R., 90, p. 390), the authors present epidemiological observations on a group of 146 nonmotile *Salmonella* cultures, antigenically indistinguishable from *S. pullorum,* which on original isolation fermented maltose with gas production in 24–72 hr. and which have since continued to be rapid fermenters. Of the 52 outbreaks from which these cultures came, 12 occurred in chickens and 40 in turkeys. It is believed that the organism is closely related to *S. pullorum,* and that little justification has so far developed for considering it a new species.

Electron microscope studies of the bacteriophage of Salmonella pullorum, M. R. B. Baylor, J. M. Severens, and G. L. Clark. (Univ. Ill.). (*Jour. Bact., 47 (1944), No. 3, pp. 277–285, illus. 15*).—This includes photographs showing normal cells and of cells after various exposures to the phage.

Effect of biotin deficiency on duration of infection with Trypanosoma lewisi in the rat, F. E. Caldwell and P. György (*Soc. Expt. Biol. and Med. Proc., 53 (1943,) No. 2, pp. 116–119*).—Biotin deficiency has been found to prolong infection with *T. lewisi* in the rat. "This effect can be negated by the administration of biotin to the deficient rat during the course of infection. Biotin appears to be instrumental directly or indirectly in the activation of the immune bodies in this infection."

Screwworms in Florida, W. G. Bruce and W. J. Sheely. (Coop. U. S. D. A.). (*Fla. Univ. Agr. Ext. Bul. 125 (1944), pp. 28, illus. 29*).—This popular account deals with the past history of this pest, method of attack, life history, effect on animals, treatment, and prevention. Colored plates of the primary screwworm fly and three blowflies are included.

Calfhood vaccination against brucellosis in the Province of Quebec, F. Trudel (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 4, pp. 97–101*).—A system of calfhood vaccination against brucellosis in the Province of Quebec was established in 1940. Preliminary results showed an incidence of abortion among 1,500 calves in their first or second period of lactation of 0.86 percent. Approximately 4 percent of the calves had to be revaccinated. The incidence of calves reacting to the agglutination test before vaccination was 0.39 percent. Eight calves lost their titer after vaccination and remained negative after calving. The highest titer obtained from calves was 1/6400. The lowest was 1/100. Sixteen calves (0.5 percent) had a fluctuation in their titer after vaccination. Only 4 of these aborted. Of the calves with a variable reaction after vaccination, or that aborted, 67.6 percent were vaccinated between 4 and 6 mo. of age. The ideal time for vaccination is considered to be between 6 and 8 mo.

Immunization as a means of overcoming bovine mastitis, W. Kearney and P. D. Moloney (*Vet. Rec., 55 (1943), No. 51, pp. 489–491*).—Following the use of a mixed autogenous vaccine consisting of staphylococcal toxoid and streptococcal anaculture, in barely 12 mo. mastitis was practically eradicated from a heavily infected herd of 80 cows. The advantages of this method are set forth.

Vaginal smears in the diagnosis of vitamin A deficiency, R. D. Hatch (Va. A. and M. Col.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 805, pp. 215–216*).—The observations reported indicated that vaginal smears by the technic used in this experiment "are not adequate to diagnose or indicate avitaminosis A in dairy cattle."

Phenothiazine in cattle practice, J. W. Britton. (Univ. Calif.). (*Vet. Med., 39 (1944), No. 6, pp. 239–242, illus. 2*).—This report of the use of this drug in cattle under California conditions discusses its efficacy in cases of parasitic gastritis, both primary and secondary. For clinical recovery, doses of 12–15 gm. for calves and 20–30 gm. for yearlings are deemed sufficient, and these are found nontoxic for cattle.

Phenothiazine and the control of internal parasites of sheep, W. T. S. Thorp. (Pa. Expt. Sta.). (*North Amer. Vet., 25 (1944), No. 4, pp. 218–221, illus. 1*).—Using in part data previously noted (E. S. R., 89, p. 483), the author recommends a yearly program calling for a combination of a phenothiazine drench and a 1:9 mixture of powdered phenothiazine and granular salt.

Sheep blowfly research, I–VI (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 18 (1943), No. 1–2, pp. 13–18, illus. 1; pp. 19–25; pp. 27–48; pp. 49–57; pp. 59–72, illus. 1; pp. 73–84*).

I. *A survey of maggot collections from live sheep and a note on the trapping of blowflies,* G. A. Hepburn.—Collections of maggots from live sheep at Onderstepoort and Dohne and the main sheep farming areas of the Union of South Africa indicated that *Lucilia cuprina* Wied. alone was responsible for 55 percent of the total strikes; in combination with other species the percentage was increased to 90. *Chrysomyia chloropyga* Wied., as a sheep myiasis-producing fly, ranked next in importance.

II. *Suint investigations,* M. C. A. Nolte.—Attempts were made to isolate and estimate some of the organic acids, chiefly lower fatty acids, said to be present in small quantities in suint. Apart from the identification of benzoic acid as a decomposition product of hippuric acid, a satisfactory separation of these acids could not be achieved, owing to the small quantities present. In olfactory tests, suint prepara-

tions and extracts (e. g., acid fractions) failed to attract blowflies. No correlation between suint composition and blowfly strike could, therefore, be demonstrated.

III. *Studies on the olfactory reactions of sheep blowflies,* G. A. Hepburn and M. C. A. Nolte.—Tests were carried on by means of an olfactometer in the laboratory, and some substances were tested under field conditions in traps. No blowfly attractant was found superior to beef bait chemically treated by the addition of cystine, calcium carbonate, calcium sulfide, sodium carbonate, sodium sulfide, and phenothiazine.

IV. *Field tests with chemically treated carcasses,* G. A. Hepburn and M. C. A. Nolte.—In these tests it was not found possible to maintain the pH of carcasses at a stage attractive to flies. The pH level alone did not appear a sufficient criterion for attractiveness.

V. *Carcasses as sources of blowflies,* G. A. Hepburn.—The object of this investigation was to determine what species of flies bred in carcasses exposed under field conditions. *L. cuprina, L. sericata* Meig., and *C. chloropyga* mainly constituted the populations of flies bred during the cool time of the year, while *C. marginalis* Wied. and *C. albiceps* Wied. constituted the populations during midsummer. Suggestions are made for the treatment of carcasses as a means of controlling blowflies.

VI. *The treatment of myiasis,* H. O. Mönnig—An attempt was made to prepare a blowfly dressing which would be rapidly lethal to the maggots and cause the strike wounds to become unattractive to blowflies and to dry and heal quickly. A dressing is described which has given good results in field tests and which is also effective for treatment against screwworm in cattle. The dressing rapidly kills ticks on animals and has given good results in a few cases of sarcoptic mange. This dressing has the following composition: Alcohol (96 percent) 40 percent by volume, mineral oil (S. A. E. 60) 5, mineral oil (C. I. fuel) 10, cresol 2.5, sulfuric acid 0.15, benzol 21.175, and neutral creosote oil (b. p. 200°–240° C.) 21.175 percent by volume. In practice the creosote oil is washed free of cresols only so far as to leave about 12 percent, which gives the correct proportion in the final mixture, and therefore no cresol is added.

Studies on the alimentary tract of Merino sheep in South Africa.—VIII, The pathogenesis of acute tympanites (bloat), J. I. Quin (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 18 (1943), No. 1–2, pp. 113–117*).—Cases of rapidly fatal bloat were definitely caused in sheep by the ingestion of fresh green alfalfa in an unwilted, unbruised condition and in the preflowering stage. It was associated with a ravenous consumption, especially of the green leafy tops, and was more evident among lactating ewes than in others feeding less greedily. Abdominal distension, especially evident in the left flank, was such as to cause complete immobilization of the diaphragm with its dome extending far forward into the thoracic cavity. The resultant asphyxia, combined with obstruction in the return of venous blood from the posterior vena cava, was responsible for the acute death.

The bloat has been shown to be closely associated with the production of gas during the rapid oxidation of sugar, mainly by yeast cells. Normal eructation of gas may be impeded as a result of excessive foam production in the forestomachs especially when animals are restricted to a diet of green alfalfa. This foaming up of the ruminal mass is directly attributable to the presence of saponin in alfalfa, which through its action on surface tension retards the breaking of the foam. Undue frothing of the ruminal ingesta can be controlled by resorting to a feeding practice in which green alfalfa is supplied to cattle and sheep only after the consumption of other foods.

Domsiekte or pregnancy disease in sheep, I–IV, (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 17 (1941), No. 1–2, pp. 225–244; pp. 245–296, illus. 13; 18 (1943), No. 1–2, pp. 263–278; pp. 279–288, illus. 6*).—Part 1 of this treatise consists of a review of the literature, by J. W. Groenewald, H. Graf, and R. Clark,

with 149 references to the cited literature. Part 2, by Groenewald, Graf, P. M. Bekker, J. R. Malan, and Clark, deals with experimental procedure and results, chemical analyses of blood and urine, and the pathology and blood picture in domsiekte. Part 3, by Clark, Groenewald, and Malan, discusses an experiment to confirm previous findings and results of treatment with rapidly acting purgatives and sugars. Part 4, by Clark, deals with the effect of obesity on the reaction of sheep to a sudden reduction in diet. In this it is concluded that obesity is a potent factor in the causation of "pregnancy disease," or domsiekte, and that in the absence of fatal acetonemia, prolonged semistarvation of sheep causes a gradual decrease in the circulating lymphocytes without affecting the neutrophiles.

Earth-eating by lamb in British Columbia, E. A. Bruce (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 4, pp. 114–116*).—Analyses of the blood of sheep from the dry interior of British Columbia showed normal calcium but low inorganic phosphorus. No definite evidence was found that either condition was the cause of earth eating by lambs, and it is suggested that physical factors associated with overgrazing may account for it.

A parasite from antelope in California, J. E. Chattin, C. M. Herman, and H. Kirby. (Univ. Calif. et al.). (*Amer. Micros. Soc. Trans., 63 (1944), No. 1, pp. 27–29, illus. 1*).—*Selenomonas ruminantium* was found in blood smears from 20 of 57 prong-horn antelopes shot by hunters in May and June. This is said to be the first report of these organisms in American ruminants or in the blood of any animals outside of Africa.

Isolement, chez le porcelet, d'alcaligènes bronchisepticus [Isolation in young pigs of Alcaligenes bronchisepticus], P. Genest (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 4, pp. 105–107*).—An organism identified as *A. bronchisepticus* was isolated in pulmonary lesions from young pigs, and is thought to have a role similar to that of *Hemophilus pertussis*.

Eradication of swine brucellosis in a college herd, H. C. Smith (*Vet. Med., 39 (1944), No. 6, pp. 249–250*).—From this study of an outbreak in an Oklahoma College herd, the author concludes that "the test and slaughter method of eradication is the most satisfactory procedure at the present time."

Recent observations on parasites in small animals, F. R. Koutz. (Ohio State Univ.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 805, pp. 199–203*).—Recent examinations for parasites made with dogs and cats brought to the clinic indicated that the 10-min. direct flotation method, using saturated sodium nitrate solution, for the detection of parasite ova gave the best results, both as to the number of ova obtained and the diagnostic value. *Trichuris vulpis* was found to be the most prevalent parasite. A number of new or rare parasites encountered are listed, and treatments for dogs and cats are discussed.

Diseases and parasites of rabbits and their control, M. W. Meek (*Montebello, Calif.: Reliable Fur Indus., 1943, 3. ed., pp. 189, illus. 51*).—This edition (E. S. R., 56, p. 679) has been greatly enlarged.

Rabbit pen construction in relation to sore hocks, G. S. Templeton (*Amer. Natl. Fur & Market Jour., 22 (1943), No. 3, pp. 11, illus. 1*).—Precautions and remedies are discussed.

Aspectos parasitários observados no local inoculado com esporozoitos de Plasmodium gallinaceum (nota preliminar) [Parasitism aspects observed in local inoculation with the sporozoites of P. gallinaceum], L. Paraense (*Mem. Inst. Oswaldo Cruz, 38 (1943), No. 3, pp. 353–359, illus. 5; Eng. abs., pp. 357–359*).—In this preliminary note, inoculations were made into normal chicks either by bite of infected yellow-fever mosquitoes or subcutaneously with salivary gland suspensions. It is concluded that "these findings lend substance to the theory that the exoerythrocytic forms are the link between the sporozoites and the pigmented parasites of the red blood corpuscles."

Selenium-arsenic antagonism in poultry, A. L. Moxon and W. O. Wilson. (S. Dak. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 2, pp. 149–151*).—In these studies, supplementing work by Dubois, Moxon, and Olson (E. S. R., 83, p. 531), arsenic at a level of 2.5 p. p. m. in the drinking water for laying hens receiving a ration containing 10 p. p. m. of selenium (seleniferous wheat) counteracted part of the effect of selenium upon hatchability and had no adverse effect on hatchability. Arsenic at a level of 5 p. p. m. was more effective, but did not completely counteract the toxic action of the selenium at a level of 10 p. p. m. Pending completion of studies which have been begun on the arsenic content of eggs from hens which have consumed arsenic-containing water, the authors "do not recommend the use of arsenic to counteract the adverse effect of selenium upon hatchability."

Studies on developmental pathology.—I, The morphogenesis of a hereditary type of microphthalmia in chick embryos, P. Gruenwald (*Anat. Rec., 88 (1944), No. 1, pp. 67–81, illus. 8*).—According to this description and in accordance with the genetic causation, a regular succession of stages was found, leading to uniform condition in all embryos of comparable age.

Studies on developmental pathology.—II, Sporadic unilateral microphthalmia and associated malformations in chick embryos, P. Gruenwald (*Amer. Jour. Anat., 74 (1944), No. 2, pp. 217–257, illus. 25*).—Continuing the study noted above, the sporadic, usually unilateral, microphthalmia of chick embryos has been analyzed in regard to its morphogenesis and probable causation. It was found to be an atypical malformation.

Studies on certain filtrable viruses.—VI, Antigenic properties of entire embryo fowl pox vaccine, D. L. Kerlin and R. Graham. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 3, pp. 225–226*).—When 71 birds selected from four of the flocks previously noted (E. S. R., 89, p. 731) were exposed, 1 yr. after vaccination, to fowl pox virus, only 3 susceptible birds were encountered. All of 10 unvaccinated control birds proved susceptible.

A Pasteurella or Pasteurella-like organism as the cause of an infectious sinusitis of turkeys, J. P. Delaplane. (Tex. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 3, pp. 247–249*).—In studies to determine the nature of the causative agent of this disease, its physiological properties were such as to indicate that it belongs in the genus *Pasteurella*. Sulfathiazole was found of some value under field conditions in hastening the recovery of affected birds.

Fowl cholera in ring-necked pheasants, C. B. Hudson. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 805, pp. 211–212*).—An outbreak causing a loss of 150 birds in 2 days out of a pen of 500 to 600 is described. An organism resembling *Pasteurella avicida* was isolated from 10 to 12 autopsies.

AGRICULTURAL ENGINEERING

[Civil engineering investigations by the Colorado Station] (*Colorado Sta. Rpt. 1943, pp. 30–32*).—Improvement of an hydraulic sand-size separator and of Parshall flume stilling-well inlets to avoid clogging are reported upon, together with a study of pipes discharging partly full in which it was found that fairly reliable results were possible when the depth of flow did not exceed 0.6 the pipe diameter. Beyond that depth the discharge-depth relation became unstable and assumed peculiar characteristics.

A ground-water investigation showed that in the South Platte basin in the year 1940 1,957 irrigation wells produced 220,000 acre-ft. of water for 165,500 acres of land, the large pumping draught lowering the water table in many areas. Subsequent semiannual measurements of depth to the water table in 189 observation wells in the South Platte and Arkansas Valleys revealed a substantial gain in nearly all

pumping districts over the preceding year's measurements, a result anticipated in view of increased river supplies and reduced pumping in 1942.

Work on a photographic method for snow surveys and snow course measurements and irrigation water-supply forecasts are also discussed briefly.

Surface water supply of the United States, 1942, parts 1, 12 (*U. S. Geol. Survey, Water-Supply Paper 951 (1944), pp. 609+, illus. 1; 962 (1944), pp. 231+, illus. 2*).—These papers record measurements of stream flow for the year ended September 30, 1942, No. 951 covering the North Atlantic slope basins and No. 962 the Pacific slope basins in Washington and upper Columbia River Basin.

Snow surveys and irrigation water forecasts for Oregon as of February 1, [March 1, and April 1], 1944. (Coop. Oreg. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv., 1944, Feb., pp. 14+, illus. 2; Mar., pp. 13+, illus. 2; Apr., pp. 29+, illus. 2*).—These surveys showed irrigation-water prospects distinctly below average as of February 1, the prospect for fair to good supply for 59 percent of irrigated lands on March 1, and the same prospect for 70 percent of irrigated lands on April 1, the beginning of the melting season. Mountain snow cover entered the melting season considerably below average on nearly all snow courses.

Irrigation-water requirements of citrus in the south coastal basin of California, A. F. Pillsbury, O. C. Compton, and W. E. Picker (*California Sta. Bul. 686 (1944), pp. 19, illus. 7*).—Similar studies of the water requirements of citrus and avocado trees in San Diego County have previously been noted (E. S. R., 63, p. 579).

Transpiration by large, vigorous, and mature citrus trees in Orange County averaged 16 in. depth of water for the normal irrigation season of April 1 to November 1. Transpiration by younger, possibly less vigorous, citrus trees in this county averaged slightly over 11 in. for the normal irrigation season. Rates of transpiration per month gradually increased from a winter minimum to a maximum of about 3 in. per month in July and August for the older orchards. The younger orchards averaged 1.9 in. per month in July and August.

Transpiration of water by citrus trees rated as being in "excellent" or in "good" condition in the interior zone averaged 21 in. for the normal irrigation season, April 1 to November 1. Transpiration for citrus trees in "fair" condition averaged 17 in., but in some such orchards the use was as high as for trees in excellent condition. Relative rates of moisture loss by depth below mulch averaged 36, 25, 16, and 11 percent, respectively, in the first, second, third, and fourth foot of normal deep soils, but 50, 29, 12, and 9 percent in the shallow soils of the Corona area. The soils of the Corona area were found exceedingly porous below 4 ft. Average transpiration rates gradually increased from a winter minimum to a maximum of about 3.7 in. per month for July and August. Results from an orchard with a summer cover crop showed transpiration 50 percent greater for the season than the average for all summer clean-cultivated orchards. In individual months these results indicated an increase of over 100 percent when the cover crop is most vigorous. Although efficiencies of 70 percent are obtainable with furrow irrigation, many orchards operated at much lower percentages. Possible causes of low efficiency are held to be (1) variations in percolation along the furrows, (2) deep percolation below the root zone, and (3) runoff from the lower ends of the furrows.

From salt-balance studies conducted 6 yr. apart, it appeared that the irrigation practices plus rainfall under the conditions of these investigations had been adequate to prevent salt accumulations in the soil within the rooting zone.

Tile drainage, a sound investment, P. W. Manson (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 3, pp. 8-9, 13, illus. 3*).—The author points out that one-fourth of the cultivated land of the State is at times too wet for the most efficient cropping and that drained land shows gains of from 8 to 50 percent of

the cost of the tiling annually, the average increased productivity being from 15 to 20 percent. Attention is directed also to the fact that a mineral soil cannot be overdrained, contrary to a common misbelief with respect to an ill effect of a drainage system in a dry season. On the other hand it is noted that neither drainage nor any other investment which cannot be paid off in large part while agricultural prices remain at wartime levels should be undertaken; that an effective drainage system must be well planned before construction is begun; and that a competent engineer must be employed for such planning. An outline of the requirements of a satisfactory design is given.

Electric light bulbs as a source of heat for hotbeds, G. E. Zerfoss and A. B. Strand (*Tennessee Sta. Bul. 190 (1944), pp. 13+, illus. 8*).—Electric-lamp-heated hotbeds proved satisfactory for propagating plants at the station and are recommended for other localities in the southeastern area. With equal wattage per sash, the electric-lamp equipment is cheaper to install and more economical to operate than soil-heating cable. For quick germination, the seedbed should be preheated to about 60° F. in preparation for planting. The electric-lamp equipment can be installed easily in a one-sash hotbed; whereas soil-heating cable requires a minimum area of 36 sq. ft., or the area enclosed by a two-sash bed. Air temperatures in the beds during the day generally are 10°–20° higher than at night. Temperatures exceeding 90° are not favorable to the best growth of plants. Proper ventilation is necessary, particularly during the early afternoon hours, to prevent excessive temperatures. Plants should be hardened, or toughened, before being set in the field. All hotbed sash should be removed from the beds from 2 to 3 weeks before transplanting and replaced only if outside temperatures approach freezing.

Of several arrangements of the bulbs, that found the most satisfactory as indicated by yield from the plants started in the hotbeds was that of sixteen 25-w. bulbs in the centers of equal squares. In the plan accompanying this report the 16 bulbs are spaced 18 in. on center.

The improved castor-bean sheller: Description, operation, and adjustment of the 24-inch sheller and separator, H. A. Arnold and M. A. Sharp (*Tennessee Sta. Bul. 187 (1944), pp. 11, illus. 6*).—This bulletin describes a larger form of the machine already noted (E. S. R., 87, p. 728). The new machines were satisfactory except where plywood was substiuted for sheet metal. Some of the plywood had to be renewed during the season because of wear. In shelling percentage and portability they were preferred to other types. The shelling principle is the same as the earlier models, but the separator is a combination of pneumatic elevator and cleaner parts incorporated as an integral unit. A fan elevates the seed, by suction, to sacking height and removes the hulls, or shells, as the seed drop through a cleaning duct into a bagger. The dust is drawn away from the operator and discharged into a cyclone collector, which may be located outside the building.

Control of weeds and grasses in cotton by flaming, J. W. Neely and S. G. Brain (*Mississippi Sta. Cir. 118 (1944), pp. 6, illus. 3*).—The principle of the process is that of the adjustment of a very hot air-blast flame so that it can be drawn by a tractor along rows of crops to kill the weed and grass by flaming the leaves, the cultivated plant being tall enough to escape exposure of its leaves to the flame and the adjustment of the intensity of the heat and time of exposure such that the stems are not affected.

The equipment tested is mounted on a two-wheel sulky. It includes a 20-gal. tank for Diesel or tractor fuel; a 45-cu.-ft. air compressor, and a 6-hp. air-cooled gasoline motor. Attached to the front end of the drive shaft of the compressor is a fuel pump. Above each burner is attached a small tank, from which fuel is slowly fed to a pilot light. The height of the burners above the ground is controlled by sleds, one for each burner. The burners are adjusted so that two flames hit the

rows from opposite sides and in tandem. Two rows are flamed at one time, four burners being employed. The burners are controlled by regulating valves on the air and fuel lines. These valves are located near the burners. The person who regulates them either walks behind the equipment or rides on the platform of the sulky.

From cost and yield data and observations of the effect of the weed-killing treatment in the field, it was concluded that this phase of the mechanization of cotton production is practical. A new set of equipment, eliminating some failings of the form used in the experiments here reported, was designed and built for testing during the 1944 season and is illustrated.

Building a sweep rake, M. M. JONES (*Missouri Sta. Cir. 284 (1944), pp. 14, illus. 10*).—Both push rakes, often made without lift and not having a construction strong enough to carry the load if raised, and transport rakes heavily made and provided with power lift, are described. The drawings show constructional details for the basket, or rack, of a push rake and some other details. For the construction of transport rakes, the authors refer to an Ohio extension bulletin on buck rakes as containing "probably the best plans for building transport rakes." Photographs of various devices, including a stripper-type push rake, are reproduced.

Dairy barn construction (*Vermont Sta. Bul. 508 (1943), pp. 18–19*).—Worn sawdust-concrete flooring in cow stalls was resurfaced with sand-concrete, sawdust-concrete, and other floorings. At the end of the first season no evidence of wear appeared. Directions as to mixing sawdust-concrete and as to the quantity of water supplied should be carefully followed. Seasoning of from 3 to 4 weeks before use is essential if one is to secure a tough wearing surface.

Vapor-proof paper installed under asbesto-cement sheets on side walls and ceiling has efficiently protected the wooden sheathing from barn air moisture for 2 yr.

Hog-housing requirements, T. A. H. MILLER, W. ASHBY, and J. H. ZELLER (*U. S. Dept. Agr. Cir. 701 (1944), pp. 16, illus. 5*).—This circular on hog houses is the first of a series of descriptions of the functional requirements of buildings to house the principal kinds of livestock, intended as a guide to the selection and construction of satisfactory types of farm buildings. It deals with the hog and its habits, distribution of hogs in the United States, functions of a hog house, building requirements as modified by climate, water requirements, methods of housing hogs, movable individual houses, central houses, space requirements, building details, permanent houses for growing and fattening pigs, miscellaneous structures, and related topics.

Watering equipment for poultry, H. D. POLK (*Mississippi Sta. Cir. 119 (1944), pp. 7, illus. 9; Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 4, pp. 1, 5–6, illus. 9*).—A pan with automatic valve for use in brooding pen, a portable range waterer, using an oil drum and automatic water valve for birds 5 weeks old to laying age, an automatic waterer for use in laying cages or for finishing broilers, and several very simple home-made devices are briefly described and are shown in photographs. Bills of materials for the equipment are included.

The design and construction of a food dehydrator ([*New York*] *Cornell Sta. Rpt. 1943, p. 88*).—A home type of food dehydrator is described having forced-air circulation provided by an ordinary electric fan, a tapered plenum chamber which equalizes air distribution among the trays, movement of air across the short dimension of the trays to reduce temperature drop, partial air recirculation to conserve heat and to provide humidity control, and thermostat control in series with about two-thirds of the heating unit assembly to reduce thermostat current load and to lengthen the operation cycle. After regulation to the desired operating temperature, operation becomes automatic for the remainder of the drying period.

Influence of zinc oxide on paint molds, S. B. Salvin (*Indus. and Engin. Chem., 36 (1944), No. 4, pp. 336–340, illus. 5*).—When fungus spores were sown on paint vehicle constituents and incubated, varying degrees of growth were observed, with raw linseed oil providing the greatest development. This showed that for mildew-resistance paint films must depend on pigments or other constituents. In tests of nine types of zinc oxide against the growth of common fungi, the inhibition was found to be a direct function of the surface area of the oxide, a fine-particle-size material proving particularly effective. Although zinc oxide is able to prevent mycelial growth, it does not kill the spores or prevent their germination after removal from the medium and exposure to a favorable environment; the action is therefore fungistatic rather than fungicidal. Respiration studies indicated that the Zn ion affects the carbohydrate metabolism of the fungus and that this property may be basically responsible for the fungistatic action.

AGRICULTURAL ECONOMICS

Current Farm Economics, [April 1944] (*Oklahoma Sta., Cur. Farm Econ., 17 (1944), No. 2, pp. 33–62, illus. 3*).—In addition to the usual review of the agricultural situation, tables of prices, and price indexes, articles are included on Number of Livestock on Farms in Oklahoma, by D. L. W. Anker (pp. 45–47); The Open Range in Oklahoma, by R. T. Klemme (pp. 48–49); and The Family Farm in Oklahoma, by P. Nelson (pp. 50–59), which analyzes the size of farms in different parts of the State and discusses some of the factors involved.

Foreign Agriculture [May–June 1944] (*U. S. Dept. Agr., Foreign Agr., 8 (1944), Nos. 5, pp. 97–120; 6, pp. 121–144*).—Included in No. 5 are articles on China's Food Problem, by O. L. Dawson (pp. 99–109), discussing the food situation and relation of the food problem to the war effort and post-war reconstruction period; and one on Agriculture and Food in Denmark, by K. J. Friedmann (pp. 110–120), discussing the agriculture and food economy prior to World War II and developments during the war. No. 6 includes an article on Food in Continental Europe and the Soviet Union (pp. 123–130), which discusses the food situation in 1943–44 in the several continental countries of Europe and the Soviet Union. An article on Agricultural Cooperation in the Middle East, by A. I. Tannous (pp. 131–144), presents a brief analysis of the village-community organization and an appraisal of the present cooperative movement and the possible future expansion.

The economic effect of soil erosion on wheat yields in eastern Oregon, H. L. Thomas, R. E. Stephenson, C. R. Freese, R. W. Chapin, and W. W. Huggings. (Coop. U. S. D. A.). (*Oregon Sta. Cir. 157 (1943), pp. 32, illus. 9*).—A total of 989 soil observations and wheat samples were obtained for the years 1939, 1940, and 1941 from 33 fields on 27 farms in 2 sample areas—Wild Horse and Rock Creek. Analyses are made of the data and the rates of soil erosion in the two areas, and the effects of depth of soil and of soil erosion on wheat yields, the long-time physical and economic effects of erosion, the effectiveness of soil conservation practices, etc., are discussed. A recommended soil conservation program is outlined.

In the Wild Horse area an average of 6.6 in. and in the Rock Creek area an average of 4 in. of topsoil had been removed by erosion during about 50 yr., the percentages of the topsoil being 34.7 and 26.6, respectively, in the two areas. The average yields of wheat in the Wild Horse area were 46 bu. on soil 48 in. or more in depth and 22 bu. on soils less than 24 in. in depth. Yields were 43 bu. where the topsoil was 14 in. or more in depth and 13 bu. where it was 6 in. or less. The yields in the Rock Creek area decreased from 27 to 20 bu. as the total soil depth changed from over 48 in. to less than 24 in. and from 31 to 21 bu. as the depth of

topsoil changed from 15 to less than 10 in. Loss of an inch of topsoil reduced wheat yields 0.9 bu. in the Wild Horse area and 0.8 bu. in the Rock Creek area. On shallow soils the loss was as much as 1.7 bu. per inch where the topsoil was less than 6 in. in depth.

"The amount that farmers can invest to prevent erosion varies with the period of tenure or the time during which the individual farmers will receive benefits. Farmers on the Wild Horse area could invest $5.42 and farmers on the Rock Creek area $2.88 per acre to prevent the loss of income from erosion that would accrue over a 20-yr. perod. An initial investment of $19 and $10 per acre for the two respective areas would be returned with interest at 4 percent within 100 yr. In lieu of these investments, at the beginning of the period, annual investments amounting to $0.80 per wheat acre on the Wild Horse and $0.42 per wheat acre on the Rock Creek area could be made for a 20-yr. period or approximately double these amounts for a 100-yr. period."

Condition and market more cattle while the Nation is at war, C. A. Brennen (*Nevada Sta. Bul. 169 (1944), pp. 13, illus. 2*).—Feed supply, cattle numbers, and beef demand under present conditions are shown to call for the marketing of a greater percentage of the cattle population of the United States. A procedure is outlined which "will safeguard the continuity and the efficiency of the breeding herds, while bringing about a necessary reduction in numbers, at an opportune time to serve the national interest and the welfare of the cattle industry."

State supervision of local taxation and finance in Michigan, M. B. Dickerson (*Michigan Sta. Spec. Bul. 327 (1944), pp. 76, illus. 1*).—"Since Michigan has relied so extensively upon legislative supervision, the compiled laws and public statutes of the State have been a main source of information. In addition, court decisions interpreting the laws and interviews with officials who enforce the laws have also been utilized. Books, pertinent articles in technical journals, and personal observations complete the sources of data."

The data are discussed in three parts covering the supervision of (1) local taxation—assessment, property tax collection, and property tax rate; (2) local financial administration—budgeting, accounting, reporting, and auditing; and (3) local indebtedness. Supervisory history, results, and recommendations for improvements are included in each chapter. Local purchasing, personnel, and highway finances are omitted, and school finance and welfare finance are discussed only briefly.

Farm Security Administration rehabilitation loan experience in five Missouri counties (June 1942), G. Harness (*Missouri Sta. Bul. 476 (1944), pp. 34*).—Analysis is made of factors taken from the records of 233 Farm Security Administration borrowers to learn what conditions and factors seem to influence significantly the progress of borrowers. Some of the findings were: "Original net worth, size of family, and age of borrower did not seem to be associated with progress. The productive capacity of the farm definitely was associated with the improvement in net worth of the borrower. . . . The less the loan was used for productive livestock, the less the progress made by the borrower. . . . It was equally true that the more the loan must be used for nonproductive purposes, the less was the rate of progress." Size of the livestock enterprise had a direct relationship to rate of improvement of economic status. "There was not much difference in the rate of progress of the groups with two or three livestock enterprises, but when four or more enterprises were present, the gain in net worth was nearly doubled and the repayment record improved."

The best repayment record was made by operators with both dairy and beef enterprises and the poorest by those emphasizing only dairying. "Larger credit extensions seemed to result in more rapid improvement in net worth of the borrower. . . . The number of years a borrower is in the program also seems to be associated with the rate of progress."

Father and son farm partnerships, E. B. Hill (*Michigan Sta. Spec. Bul. 330 (1944), pp. 43, illus. 10*).—The chief subjects discussed are the essentials of a successful father-son partnership, essentials of father-son operation agreements, the Michigan Father and Son Farm Partnership Plan, and the transferring of farm property from one generation to the next. An appendix includes a suggested form for a father and son farm-partnership agreement.

Crops and Markets, [April 1944] (*U. S. Dept. Agr., Crops and Markets, 21 (1944), No. 2, pp. 69–112, illus. 8*).—Included are the usual crop and market reports and other tables. Tables and a chart show the prospective plantings (March 1944) of different crops. An article, Index Numbers of Agricultural Prices, 1910-44, deals with the prices received and paid by farmers and includes monthly price indexes for a considerable number of commodity prices.

FOODS—HUMAN NUTRITION

The relation of ultra-violet light and temperature during aging to quality of beef.—II, Utility grade short loins, J. Sotola, J. A. McIntosh, C. C. Prouty, J. B. Dobie, M. E. Ensminger, and M. A. McGregor (*Washington Sta. Bul. 431 (1943), pp. 16*).—In continuation of this study (E. S. R., 88, p. 847), the effects of ultraviolet light treatment upon the microflora of the surfaces and the weight shrinkage during a 147-hr. aging period were investigated. Immediately after aging, steaks 1½ in. thick were cut from the short loins of beef employed and cooked to an internal temperature of 147° F. in an oven maintained at 300°. Cooked steaks from the short loins of "utility" or "C" grade aged at 50° were equal or superior in tenderness, texture, and shear-force to the corresponding loin aged at 34°. With one exception, steaks from "good" or "A" grade loins aged 147 hr. at 34° were slightly more tender and of finer texture than the utility grade loins regardless of the aging methods employed (with or without ultraviolet treatment). The utility grade short loins shrank slightly more in weight when aged at 50° (4.0–9.0 percent shrinkage) than at 34° (3.5–5.3 percent shrinkage). Total weight losses (drip and evaporation) during cooking ranged from approximately 7–12 percent. In most cases the losses were greater in steaks from the loins aged at 34° than at 50°. "No differences were observed in intensity and desirability of flavor of cooked kidney fat as a result of aging, temperature, and grade, and the same was true of flavor scores of cover fat, of the lean, and of the quality and quantity of juice. The peroxide number test showed no chemical evidence of meat rancidity. The average consumer probably could detect no undesirable flavors in the meat. Confirming previous observations, the acidity of beef decreased slightly in cooking. . . . Ultraviolet light treatment was found to have a retarding effect on the development of microorganisms at both 34° and 50°. The inhibiting effect was greater with the microflora on the uncut than on the cut surfaces. The initial surface microflora of loins as coming from the packing plant was found to vary considerably irrespective of meat grade. Excessive bacterial development did not occur even in the absence of ultraviolet light treatment, and untreated loins yielded as palatable and as tender steaks as treated loins."

Notes on the composition of some varieties of onions, J. G. Sherratt (*Analyst 68 (1943), No. 808, pp. 200–202*).—The samples of fresh onions analyzed included several varieties, all grown in a small area in northwest England. The constituents, determined on the edible portion only, were selected primarily for their value in analytical control work involving identification and estimation of the the amount of onion in commercial products. The samples contained approximately 88-92 percent moisture, 0.5 percent fiber, soluble nitrogen equivalent to about 1 percent of protein, 6–9 percent sugars, 0.2–0.5 percent acid (as citric), and 0.5–0.8

percent soluble ash. There were traces of volatile organic sulfides. Data are also reported for a sample of dried onion powder.

National flour and bread.—Third report from the Scientific Adviser's Division, Ministry of Food (*Nature [London], 151 (1943), No. 3840, pp. 629–630; abr. in Analyst, 68 (1943), No. 811, pp. 306–307*).—This report deals with the 379 samples of flour and 381 of bread received in the period from early October 1942 through May 8, 1943. In this period, National wheat flour was changed through increase in the percentage of home-grown wheat used (averaging 43.6 percent at the time of the report), addition of skim milk powder (2 lb. per sack), and inclusion of barley or a mixture of groats (dehulled oats) and barley as part of the grist (from February 13, 1943). Fortification of the flour with $CaCO_3$ was already in effect. Based on the analyses of the samples examined, the "national average" figures for fiber and vitamin B_1 were 0.55 percent and 1.00–1.05 International Units per gram, respectively. The corresponding figures for the period March-October 1942 were 0.7 percent and 1.05–1.10 I. U. per gram. The decrease in fiber content in the latter period is attributed to new methods of milling to improve the quality and digestibility of the flour. In a small series of samples obtained from large and small mills from February 12 to April 4, protein averaged 11.3 percent (consistent with about 50 percent English wheat in the grist), fiber 0.50 percent, riboflavin 1.5 μg. per gram, and vitamin B_1 1.00 I. U. per gram. The breads examined, although nutritionally improved, showed a fall in loaf quality over the preceding period, due to the new type of flour containing the high percentage of English wheat and a proportion of barley or groats.

Digestion of whole wheat and white breads in the human stomach, H. H. Rostorfer, C. D. Kochakian, and J. R. Murlin (*Jour. Nutr., 26 (1943), No. 2, pp. 123–138*).—In gastric digestion experiments with six human subjects, a comparison was obtained of the gastric digestion rates, for the carbohydrate and protein fractions, of peeled-wheat and white breads. An hour after digestion of the bread as a test meal, samples were withdrawn from the stomach by means of of the Rehfuss tube and analyzed for total and free acidity, total solids, pepsin, total and free reducing substances, and total and soluble nitrogen. The rates of carbohydrate and protein gastric digestion were calculated from these nitrogen and carbohydrate data, corrected for time lost in sampling and for free reducing substances and total and soluble nitrogen in the breads. The rate of digestion of the protein of peeled-wheat bread made with high-vitamin yeast was 15 percent faster than that of peeled-wheat bread made with ordinary bakers' yeast, and the free sugar formation due to action of salivary amylase was 11 percent faster; about the same increase in digestion rates was effected by calcium pantothenate administered in 16-mg. doses (at 8 to 10-hr. and 1-hr. intervals) before the test meal of the peeled-wheat bread made with the ordinary yeast. The meal of the bread with the enriched yeast furnished only 0.45 mg. additional pantothenic acid, suggesting that if this vitamin was responsible for the increased digestion rates, the relatively small amount was as effective as the much larger amount taken before the meal. The protein and carbohydrate digestion rates of white bread made with high-extraction flour, added milk solids (3.5 percent), and a high-vitamin yeast showed protein and carbohydrate digestion rates 36 and 3 percent greater, respectively, than corresponding rates for the peeled-wheat breads; increases of 61 and 11 percent, respectively, were noted with an ordinary white bread made with straight grade flour (72 percent extraction), milk solids (2.5 percent), and ordinary yeast. This ordinary white bread, however, was digested only 39 percent faster than peeled-wheat bread baked with high-vitamin yeasts with respect to protein, and not at all faster with regard to carbohydrate. The shortcoming of the whole wheat bread was apparently not attributable to lesser peptogenic action, for the pepsin content of the gastric digestions was 40 percent higher than in those from white breads.

Nutritive value of cotton, peanut, and soy seeds, T. F. and L. Zucker (*Indus. and Engin. Chem., 35 (1943), No. 8, pp. 868–872, illus. 3*).—The effect of graded amounts of these seed flours as supplements to white flour in supporting growth in rats was observed in a series of feeding experiments with carefully selected young stock rats fed the diets ad libitum from 4 to 14 weeks of age. Each of the seed flours was studied at levels of 5, 10, and 16 percent in the diet, and cottonseed flour also at the 24-percent level. The diets were supplemented with suitable salt mixtures and adequate supplies of the fat-soluble vitamins, so that the variables were reduced to protein and the vitamins of the B complex. To test for adequacy of B complex factors additional groups were run with the addition of 4 percent rice bran extract, and to test for adequate protein check experiments were conducted with the addition of blood fibrin to make the estimated protein content approximately constant. The ability of the diet to support maximal growth in rats (E. S. R., 86, p. 703) was used as a criterion. The growth weights attained, expressed as percentage of the optimal weights for rats of the strain used, and the growth curves, presented by way of illustration for the cottonseed flour only, indicated consistently that the soybean flour was a little better than the cottonseed flour and the latter a little better than the peanut flour. The superiority of the soybean was attributable to its protein quality. The cottonseed flour was superior as a source of the B complex, supplying an optimum amount at the 10-percent level, whereas the soybean flour at that level supplied definitely less than an optimum amount, and peanut flour, even at the 16-percent level, supplied suboptimal amounts of the B complex. Assay values for the B factors confirmed the value of the cottonseed flour as a source of the B vitamins, riboflavin in particular (10 μg. per gram), and showed peanut flour to be high in nicotinic acid (approximately 200 μg. per gram). "As substitutes for both the protein and the vitamins of meat, a mixture of the three seed flours offers possibilities."

Cane syrup in infant feeding, R. O. Townsend, O. D. Abbott, and C. F. Ahmann (*Florida Sta. Bul. 398 (1944), pp. 7*).—This report discusses the effects of feeding evaporated milk supplemented with cane sirup on the weight and hemoglobin values of 12 babies started on the formula at from 1 to 8 weeks of age and carried on this feeding regime through the twenty-fourth week of age. These babies, few of whom were considered healthy as the feeding tests began, varied in weight at this time, and also at birth, and showed symptoms of malnutrition. At the end of the twenty-fourth week, however, they were all within the normal range in regard to weight and hemoglobin, half of them being in the upper part of the hemoglobin range, and all were apparently sound and healthy, with no symptoms of malnutrition or digestive disturbances. It is concluded that the cane sirup provided a safe and effective dietary source of iron for babies.

Home canning rules have reasons, H. Kafka (*Minn. Farm and Home Sci. [Minnesota Sta.], 1 (1944), No. 3, pp. 1, 14–15, illus. 2*).—This step-by-step discussion of canning procedures gives the reason for each of the directions offered and presents a well-rounded picture of why the instructions must be followed if canning accidents and canned-food spoilage are to be prevented.

Principles and methods in the canning of fishery products, N. D. Jarvis (*U. S. Dept. Int., Fish and Wildlife Serv., Res. Rpt. 7 (1943), pp. 366+, illus. 66*).—This report, essentially a reference handbook on the commercial canning of fishery products, discusses the scientific principles on which canning is based, outlines various engineering problems in canning, and describes in detail the present-day methods for the commercial canning of 58 varieties of fish and shellfish packed in hermetically sealed containers. Information is given on spoilage and methods used in the examination of fishery products, and a brief section is devoted to the nutritive value of canned fishery products and their use as food.

Home fruit and vegetable dehydration, E. H. Wiegand, T. Onsdorff, and A. Holmes (*Oregon Sta. Cir. 149 (1943), pp. 18, illus. 7*).—Following a brief discussion of the principles of dehydration, instructions for dehydrating fruit and vegetables are presented, with emphasis on selection of prime fresh material and proper preparation for drying in order to conserve nutritive value as well as quality. Consideration is given to the method of preparing particular vegetables and fruits, including sulfuring for certain fruits; the operation of the dehydrator, a home-made cabinet; the packaging and storage of the dehydrated products; and the preparation of the dehydrated foods for cooking.

Enzyme reactions in dehydrated potatoes, W. V. Cruess, M. Smith, and E. G. Balog. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 5, pp. 135, 155*).—The darkening and reddening of freshly peeled potatoes, especially around the eyes, was not prevented by blanching the tissue at 160°F., a temperature high enough to destroy catalase but not peroxidase. The usefulness of the catalase test for dehydrated potatoes is therefore questioned. Heating at 170°–175° destroyed most of the peroxidase and prevented most of the darkening; and complete destruction of peroxidase by heating to 190°–200° entirely prevented the reddening. A more effective and simple treatment for preventing the discoloration was immersion of the peeled potatoes for a few seconds in dilute bisulfite solution (0.3–1.0 percent sodium bisulfite or metabisulfite); SO_2 and sulfite in dilute solution were also effective. In experiments with potatoes blanched at different temperatures, it was found that some of the lots of dehydrated potatoes showed a strong, positive peroxidase reaction even though they had been blanched sufficiently to prevent discoloration during dehydration. These kept as well as the ones which had been blanched until free of peroxidase. It is considered, therefore, that the present insistence on a negative peroxidase reaction in dehydrated potatoes is not justified.

Dehydrated spinach: Changes in color and pigments during processing and storage, H. J. Dutton, G. F. Bailey, and E. Kohake. (U. S. D. A.). (*Indus. and Engin. Chem., 35 (1943), No. 11, pp. 1173–1177, illus. 5*).—The analytical procedures described for determining chlorophyll, pheophytin, xanthophyll, and carotene in a single sample of dehydrated vegetables involved rehydration of the sample and extraction of the pigment from the rehydrated material by acetone, transfer of pigments to ether, and direct spectrophotometric analysis for chlorophyll and pheophytin. This was followed by saponification and removal of the chlorophyllous pigments and chromatographic isolation, and spectrophotometric determination of carotene and xanthophylls.

Changes in color of dehydrated spinach from bright green to darker shades of green (as observed visibly, and by light reflectance measured spectrophotometrically) were observed to occur as the time of blanching prior to dehydration was increased. These changes were found to be correlated with the conversion of chlorophyll to pheophytin. Carotene, however, was protected by blanching against loss in the subsequent dehydration process. The destruction of chlorophyll during the storage of unblanched dehydrated spinach, although associated with loss of palatability and ascorbic acid, was not an indication of carotene loss because the carotene destruction proceeded by a reaction different from that involved in the decomposition of chlorophyll. The destruction of chlorophyll was accelerated by increased moisture content, but was very little affected by the oxygen (or air, or CO_2, or N_2) content of the storage atmosphere; the rate of carotene destruction was accelerated by O_2 in the storage atmosphere, but was unaffected by moisture content. Changes in color due to changes in chlorophyll content obscured those due to changes in carotene content. Because of this it is concluded that in the storage of green dehydrated vegetables there is little possibility of correlating carotene content and spectral reflectance measurements.

The dehydration of pork, J. A. Pearce (*Canad. Jour. Res., 21 (1943), No. 12, Sect. D, pp. 394–404, illus. 1*).—"Four preprocessing and three drying procedures for the dehydration of pork were studied. The best product resulted from cooking in an open steam-jacketed kettle, followed by mincing and tunnel-tray drying in 4 hr. or less with a tray load of 2 lb. per square foot. Little difference in quality of the product was observed for air velocities of 700 to 1,200 ft. per minute over the trays, or for initial stage temperatures between 70° and 80° C. and final stage temperatures between 55° and 70°. Pork, when dried to a moisture content of 3 to 4 percent in less than 4 hr., still retained a high percentage of the thiamine present in the raw meat, showed no fat deterioration when assessed by peroxide oxygen determinations, and on reconstitution had a palatability rating approximately equal to that of the initial cooked material."

The use of dehydrated eggs in bakery products, J. G. [Woodroof]. (Ga. Expt. Sta.). (*Bakers Digest, 17 (1943), No. 4, pp. 25–26, illus. 1*).—Uniformity, stability, and ease of storage and handling are noted as particular advantages in the use of dehydrated eggs which, except for frying whole and boiling, may be used much the same way as fresh or stored eggs, especially if properly rehydrated. Although egg powder may be incorporated dry in certain mixes, for best results it should be rehydrated and used as if fresh, in the regular formula. Two parts of unsifted dry egg with 2½ parts of water will yield the equivalent of fresh eggs. In general, 1 cup of unsifted dry egg mixed with 1¼ cups of water is the equivalent of eight fresh eggs. To prevent lumping, the egg powder should be sifted before mixing with the water, which may be cold, or preferably, warm, but never hot. The egg may be added to the water, or the water to the egg, and the mixture beaten with a rotary egg beater.

Preserving sweet potatoes by freezing, J. G. Woodroof and I. S. Atkinson (*Georgia Sta. Bul. 232 (1944), pp. 26, illus. 8*).—This report of investigations on the utilization of the sweetpotato for the preparation of a frozen-food product presents the results obtained by variations of procedure in the several stages of the process and indicates that one of the most satisfactory products from the standpoint of operating time, low waste, and quality of the final product was obtained by the following procedure: (1) Grading of the sweetpotatoes for size, color, and degree of curing since various steps in the process were dependent on these factors; (2) peeling by treatment for 5–6 min. with boiling 10-percent lye solution, followed by thorough washing to remove all traces of lye and of disintegrated tissue; (3) cooking the peeled potatoes under steam pressure in a retort at 10 lbs. pressure for 5–25 min., depending on the size of the sweetpotatoes, to an internal temperature of 190° F.; (4) mechanically pulping the cooked potatoes; (5) addition of 0.2–0.4 percent citric acid to the pulp to prevent darkening; (6) rapid freezing of the product, and storage at 0° in containers as rigid and as close-fitting as possible. "Because of ease and economy of preparation as well as higher yield, it is recommended that sweetpotatoes be frozen in the puree form. Sound, cured potatoes of all sizes above 1.5 in. in diameter are satisfactory for puree. The freezing and storing of sweetpotato slices or puree is simple and presents no special problem. It is estimated that sweetpotato puree can be prepared, frozen, and stored for 6 mo. for about 7 ct. per pound. A suggested list of equipment, for a commercial production line for processing and freezing sweetpotatoes, is given. Processing sweetpotatoes converts about three-fifths of the starch into maltose, and from 2 to 5 percent of the total carbohydrates may be lost through leaching, during processing. Frozen sweetpotatoes, sliced or as puree, can be utilized in the same way that unfrozen potato slices and puree may be, as in pies, tarts, puffs, souffle, custard, fried potatoes, and in combination dishes and desserts."

Angel food cakes made from fresh and frozen egg whites, E. L. Miller and G. E. Vail. (Kans. State Col.). (*Cereal Chem., 20 (1943), No. 5, pp. 528–535*).—The best beginning temperature for whipping egg whites for angel-food cakes was found to be 70° F., and the best baking temperature 400° for 35 min. or 425° for 30 min. These conditions proved best whether the egg white used was No. 1 fresh, thick frozen, or thin frozen. The egg whites, when whipped at the beginning temperature of 70°, gave good foams which remained quite stable and produced cakes that were more tender, whiter, and of greater volume and better texture than cakes from whites beaten at the beginning temperatures of 40°, 50°, or 60°. The thin frozen whites whipped more quickly than the thick frozen ones, and both types whipped more quickly than the fresh whites. Both the thin frozen and the fresh whites produced cakes of high quality with similar characteristics, but those made from the thick frozen whites were less desirable. In the baking tests, employing baking temperatures of 350° for 40 min., 375° for 35 min., 400° for 30 min., 425° for 25 min., and 450° for 21 min., volume increased with increase in temperature up to 425°, but at 450° there was a definite loss of volume and the cakes were very moist. Cakes baked at 400° had the greatest compressibility and the highest palatability score, but were less tender than some other cakes; those baked at 425° were most tender and rated high in compressibility and palatability.

Pectinates improve frozen fruit, R. E. Buck, G. L. Baker, and H. H. Mottern. ((U. S. D. A. and Del. Expt. Sta.). (*Food Indus., 16 (1944), No. 2, pp. 100–102, 134–135, illus. 1*).—A number of pectinates differing in methoxyl content and method of preparation were used. The pectinate mixed with the sugar was sprinkled over and mixed with the prepared fruit, which was frozen as a dry-sugar pack and stored at 0° F. Samples, examined after 3–4 days and again after 4–6 mo., were allowed to stand until the contents reached room temperature, when they were drained under definite conditions. Weight, content of soluble solids, and viscosity of juice were determined, and the samples were examined for color, gel formation, and general appearance.

In the tests with strawberries, raspberries, red cherries, and peaches, the pectinate was found to reduce the amount of juice drained from the thawed fruit, apparently through the pectinate combining with the calcium of the fruit to form a protective calcium pectinate gel on the surface of the fruit. The appearance of the fruit was also improved by the pectinate treatment. The quantity of pectinate required to reduce the amount of drained juice by 50 percent, as compared with untreated samples, was found to be the amount to give the most desirable amount of gel formation. The presence of the pectinate in the fruit made possible the direct preparation of jellied products. The short heating required gave the jellied products a better flavor than that of the ordinary pectin jelly products.

The effect of concentration on the composition and properties of rediluted apple juice, A. M. Neubert. (Wash. Expt. Sta. coop. U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 6, pp. 166–169*).—Untreated apple juice filtered until clear through cotton duck in a filter press with the aid of diatomaceous earth, and apple juice clarified by treatment with a commercial pectin-decomposing enzyme were concentrated by evaporation under vacuum and by freezing. The concentrates were diluted with recently boiled distilled water to essentially the same concentration as the original juices, and both the original and reconstituted juices were then bottled and capped, pasteurized in boiling water, cooled, and stored 2–4 mo. until analyzed. Neither type of juice was altered in appearance by the concentration process followed by dilution. The untreated juices became turbid during the heat treatment, whereas the enzyme-clarified juices remained clear. The vacuum-concentrated juices were nearly devoid of aroma, but those concentrated by freezing retained nearly all of the original aroma. Flavor, however, was scarcely

altered by either concentration process. The reconstituted juices were essentially the same concentration as the original juices, as indicated by Brix, specific gravity, and refractive index values. Changes in the alcohol precipitate and pectic acid due to concentration and dilution were less than the differences normally occurring between different samples of the fresh or the preserved apple juices. It is considered that with certain precautions apple juice can be concentrated either by vacuum distillation or by freezing, and rediluted without seriously affecting its chemical composition.

Food consumption levels in the United States, Canada, and the United Kingdom, P. L. KOENIG, H. F. ANGUS, P. G. H. BARTER, ET AL. (*U. S. Dept. Agr., War Food Admin., 1944, pp. 121+, illus. 4*).—This report of a special Joint Committee set up by the Combined Food Board "deals mainly with the levels of food supplies moving into civilian consumption in the United States, Canada, and the United Kingdom in the year 1943 and in the pre-war period (defined for the United Kingdom as 1934 to 1938 and for the United States and Canada as 1935 to 1939). Part 1 of the report sets out the general problems involved in making such a study and the methods adopted for overcoming them. The comparison of consumption levels in the United States, Canada, and the United Kingdom is made in part 2 of this report. Chapter 5 makes the comparison in terms of nutrients, and chapter 6 in terms of the quantities of the different foods consumed. In addition, the trends of food-supply levels over the intervening years and the foremost trends in the year from July 1943 to June 1944 are briefly discussed." This material was assembled for the purpose of providing a working basis for the guidance of the Combined Food Board and of the appropriate governmental agencies of the Governments concerned in the allocation of foods in short supply.

Cut food waste (*U. S. Dept. Agr., War Food Admin., Off. Distrib., 1944, NFC–12, pp. 8*).—This leaflet, pointing to the enormous food wastage in America, something like 125 million pounds every day from farm to table, gives many practical suggestions, each summed up in a brief sentence, on ways to save food in the home. These suggestions are concerned with careful planning and shopping, proper storage to keep foods fresh, and thrifty ways of preparing and using foods and serving them at the table.

Growth in mice fed diets rendered deficient in cystine, but not in methionine, C. D. BAUER and C. P. BERG (*Jour. Nutr., 25 (1943), No. 5, pp. 497–502*).—"Mice fed 14.7 percent of casein and 0.3 percent of cystine in diets complete in other factors grew slightly better than mice fed 18 or 32 percent of casein. When a hydrolysate of casein, deficient in cystine but not in methionine, was incorporated at a level of 14.8 percent in a diet along with 0.2 percent of tryptophane, it supported growth less well than when it was further supplemented with cystine or methionine, or both. Growth on the unsupplemented diet and its acceleration to the same extent by the addition of either cystine or methionine both suggest that the mouse is able to synthesize cystine when methionine is provided."

Nutritional studies on Streptococcus lactis.—I, An unidentified growth factor found in yeast extract, F. R. SMITH. (Univ. Calif.). (*Jour. Bact., 46 (1943), No. 4, pp. 369–371*).—A basal medium described and containing glucose, sodium citrate, various salts, various members of the vitamin B complex, and various amino acids failed to support growth of the organism; even supplementation of the medium with additional amino acids and vitamins failed to bring about satisfactory growth response. Addition of a yeast extract, however, was found to stimulate the organism, resulting in very good growth and acid development. The unknown factor in the yeast extract was apparently organic in nature, although not a known vitamin or any one or more of the 23 amino acids tested. It was not precipitable with Pb, Ag, Hg, Cu, or Zn salts. Fuller's earth or darco-activated

charcoal failed to adsorb it at various pH values. It was not soluble in any common lipoid solvent. Heating to 210° C. under vacuum destroyed the activity.

The choline content of animal and plant products, R. W. ENGEL. (Ala. Expt. Sta.). (*Jour. Nutr., 25 (1943), No. 5, pp. 441–446*).—Choline in a number of plant and animal materials was determined as the reineckate by a procedure previously described (E. S. R., 88, p. 433), except that certain modifications were necessary for application of the method to milk. Egg yolk containing 17.13 mg. choline chloride per gram (32.81 mg./gm. dry basis) was the richest source of choline. Visceral organs and nervous tissue containing 1.65–6.52 mg./gm. (10.01–22.72 dry basis) were better sources than muscle tissue, which contained 0.77–1.39 mg./gm. (1.81–5.41 dry basis). Green leafy plant material compared favorably with muscle tissue. Good sources of choline in the plant material were the green leafy and leguminous vegetables, seed oil meals, and grain germs. Seed oil meals were equal or superior to the whole seeds as sources of choline. Skim milk powder contained 1.59 mg. of choline per gram, as compared with 1.07 mg./gm. of whole milk powder.

Common southern vegetables supply needed minerals, O. SHEETS (*Miss. Farm. Res. [Mississippi Sta.], 7 (1944), No. 4, pp. 1, 2*).—It is pointed out in this discussion that calcium, phosphorus, and iron, minerals in which many southern diets are often deficient, can be supplied by vegetables commonly used in the South, particularly turnip greens, mustard greens, and collards, which are rich in calcium, phosphorus, and iron, and legumes, fresh or dried, and including cowpeas, butter beans [lima beans], and soybeans, which are rich in phosphorus and iron. The mineral data presented are taken from sources noted, the calcium and phosphorus analyses of the fresh and dried cowpeas being credited to the chemistry department of the station.

The effect of dietary fat on bone calcification in the growing rat, R. BUNKFELDT and H. STEENBOCK. (Wis. Expt. Sta.). (*Jour. Nutr., 25 (1943), No. 5, pp. 479–489*).—A cereal-free low-lipide basal diet containing 0.04 percent P and 0.02 percent Ca was used with cottonseed oil as the added fat and with the Ca : P ratio adjusted as desired with the addition of $CaCO_3$; P was added in the form of a mixture of inorganic phosphates or phytic acid, the additions being such that in the variously adjusted rations P was kept at the level of 0.075–0.11 percent, except in the case of the phytic acid diet in which it was increased to the physiologically equivalent level of 0.17 percent. When cottonseed oil was included in the ration, calcification was decreased uniformly and in proportion to the amount of oil fed (5, 10, and 20 percent levels in the diet). This occurred whether the P of the ration was derived from phytic acid or inorganic phosphates and with a high Ca : P ratio (6 : 1 or 3 : 1) or a low ratio (1 : 1), and in the presence or absence of vitamin D. When, in the basal ration, fibrin, yeast, and starch were substituted for egg white, rice bran concentrate, and glucose, respectively, the effect of the cottonseed oil was the same. The decrease in calcification with increasing fat content of the ration paralleled the increase in body weight. The increments in weight appeared not to be due to an increase in either lipide-free soft tissues or lipide-free bone. When the P content of the diet was adjusted to the "optimal" level of 0.25 percent, the addition of cottonseed oil (20 percent level) effected a pronounced increase in calcification; with more than optimal P there was a lesser increase in calcification. This effect was maintained with Ca : P ratios up to 4 : 1; with a ratio of 6 : 1, however, the addition of the cottonseed oil effected but little improvement in bone calcification.

The effect of cocoa upon the utilization of the calcium and phosphorus of milk, W. S. MUELLER and M. R. COONEY. (Mass. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 10, pp. 951–958, illus. 2*).—Growth rate of young rats and

their Ca and P retention, as determined by analyses of test animals at the end of the experiment in comparison with similar analyses of controls at the beginning of the experiment, were used as criteria for indicating the effect of cocoa on the utilization of Ca and P from a diet of whole milk powder, sugar, cocoa, and mineral supplements (Fe, Cu, Mn salts). The cocoa-fed rats showed a significantly lower rate of growth than control rats receiving a diet containing only the milk powder, sugar, and minerals. The cocoa-fed rats also showed a significantly lower body retention of Ca and P than did the control rats. The decrease in Ca retention was greater than could be accounted for by the oxalic acid present in the cocoa. The cause of the decreased P retention was not clear. "While results obtained with small animals cannot always be applied directly to human beings, yet the fundamental facts obtained in this study would seem to indicate that the indiscriminate and excessive use of chocolate-flavored foods, especially in a diet already low in calcium, should not be recommended."

Effect of severe calcium deficiency on pregnancy and lactation in the rat, M. D. D. Boelter and D. M. Greenberg (*Jour. Nutr., 26 (1943), No. 2, pp. 105–121*).—Rats were reared from weaning time on a synthetic diet similar to one previously used (E. S. R., 85, p. 417) and containing only about 10 mg. of calcium per 100 gm. of food. These animals failed to mate. Female rats which had previously borne a litter each showed greatly reduced fertility, as evidenced by the very low production of viable young when transferred to the diet low in calcium. Mothers and young, particularly the latter, showed symptoms of calcium deficiency, including susceptibility to hemorrhages, prostration, and paralysis induced by a galvanic stimulus. These results confirmed earlier observations with growing rats on a calcium-low diet (E. S. R., 86, p. 866). "Pregnancy was not a great drain upon the calcium stores of the mother rat, but lactation definitely reduced the amount of skeletal calcium. This was shown by a lowering of total body calcium content, serum calcium concentration, percentage bone ash, and percent of calcium of bone and ash. These changes were magnified by a marked loss in weight by the mother during lactation as contrasted to a maintenance of body weight during gestation. Calcium-deficient young that were able to survive were almost normal at birth except for a low bone ash and bone calcium content. The deficient mother was able to supply some calcium to the young during the lactation period but not enough to maintain the normal calcium content of the skeletal structures. She was not capable of providing enough milk to allow for the normal growth of her young."

A study of the availability of the iron in enriched bread, H. R. Street (*Jour. Nutr., 26 (1943), No. 2, pp. 187–195, illus. 2*).—Young rats made anemic by rearing on a diet of whole cow's milk were given, while still maintained on the milk diet, supplements of iron supplied to the several test groups by sodium iron pyrophosphate, ferrous sulfate, and ferric sulfate. The pyrophosphate compound and the ferrous sulfate were given at two levels, supplying 0.15 or 0.30 mg. of iron per rat day; the ferric sulfate was given only at the lower level. As indicated by hemoglobin regeneration in a 4-week period, the iron of the pyrophosphate was somewhat less than 50 percent as available as that of the ferrous sulfate. Ferrous and ferric sulfates were equally well utilized.

In other tests anemic rats were transferred to a diet in which the iron was supplied by enriched bread. The dried bread, constituting 82 percent of the ration, supplied 89 percent of the iron. Other dietary constituents were adequate. Hemoglobin regeneration in the anemic rats receiving the bread enriched with sodium iron pyrophosphate was again somewhat less than 50 percent of that occurring with bread enriched with ferrous sulfate. Although the rations were consumed ad libitum, the food intakes of the animals in the several test groups were quite similar, so that

the differences in hemoglobin regeneration were due to the lower availability of the iron of the pyrophosphate compound.

The vitamin content of milk related to certain feeding practices in Arizona, H. FARRANKOP, M. C. SMITH, W. H. RIDDELL, and R. N. DAVIS (*Arizona Sta. Mimeog. Rpt. 61 (1944), pp. 14+, illus. 1*).—This preliminary report of a study of the monthly variation in the vitamin A content of milk from Holstein cows on different feeding programs as practiced in Arizona presents data on the vitamin A, carotene, fat, and solids contents of the pooled milk from individual herds tested in the 6 mo., October through March, during which time the herds were maintained on one of the following roughages in addition to grain mixtures: (1) Pasture (alfalfa, oats, and/or barley), (2) cut green feed, or soilage (alfalfa, barley, wheat), in addition to other roughage, and (3) hay or hay and silage.

"The data show that the total vitamin A activity of milk from all pasture-fed herds ranged from 888 to 2,423 I. U. per quart, and for the 6 mo. tested averaged 1,578. The herds maintained on hay and silage produced milk ranging from 462 to 1,424 I. U. per quart, with an average of 922. Thus, it is evident that milk from cows receiving roughage in the form of pasture is definitely higher in total vitamin A activity than from cows receiving hay or hay and silage without any green feed. The average total vitamin A content of milk from the soilage-fed herds was 1,178 I. U. per quart, showing a slight increase over that from cows on dry-lot feeding." Analyses of the forages for carotene content showed the 64 samples of hay to range from 0.30 to 6.11 mg. per 100 gm., with an average of 1.83. The 21 silage samples assayed showed an average carotene content of 0.67 mg. per 100 gm., with a range of 0.07 to 2.99 mg. Thirty-eight pasture samples were analyzed and found to contain 6.14 to 35.42 mg. of carotene per 100 gm., averaging 20.72. Only 6 soilage samples were available for assay, but they showed an average carotene content of 11.14 mg. per 100 gm. "It is evident that the vitamin A value of milk can be increased by making more green feed available to the cow. The superiority of succulent green feed as a source of carotene in the ration of the dairy cow is apparent both from the carotene content of the feeds themselves and the vitamin A content of the milk produced by the cows on these feeds."

The recovery of the B vitamins in the milling of wheat, S. H. JACKSON, A. DOHERTY, and V. MALONE (*Cereal Chem., 20 (1943), No. 5, pp. 551–559*).—Thiamine, riboflavin, and niacin were assayed in samples of all the flour and feed streams of a large Canadian flour mill. Nearly half of the niacin of the wheat appeared in the bran stream, indicating that niacin is largely concentrated in the branny layers. Although the bran stream was highest in niacin, it was lowest in thiamine; the reverse was true of the germ. Dissection experiments, accompanied by analyses of the parts and subsequent calculations, showed that the embryo contained 21 μg. of thiamine per gram and carried 11.8 percent of the total thiamine of the wheat, while the scutellum contained 44 μg. per gram and carried 59 percent of the total. The bran and endosperm cells adjacent to the germ were found to contain only 1.12 μg. per gram. The entire wheat kernel other than the embryo and scutellum, representing 93.2 percent of the wheat, contained only 30 percent of the thiamine. The riboflavin was much more evenly distributed throughout the kernel than the thiamine or the niacin. In the germ fraction where the riboflavin was most concentrated it was only 8.5 times the concentration in the lowest stream. The total combined flours contained 40 percent of the riboflavin as compared with 25 percent of the thiamine. Data are reported for the B vitamins in "Vi-Bim," a high vitamin product produced by further grinding and sifting certain component streams, and used for addition to white flour to raise its thiamine content to the level required for "White Flour, Canada Approved" (2.4–2.65 μg. per gram.).

How distribution of vitamins in wheat affects flour, J. S. Andrews (*Food Indus., 15 (1943), No. 8, pp. 78–79, illus. 1*).—To determine the effect of extended extraction of wheat flour the vitamin contents were calculated for the combination of products which would be approximately represented. For example, the combination of patent and first clear was used for estimating a 70 percent extraction. Such estimates of the percentage of the total vitamin in wheat plotted against percentage of extraction gave distribution curves indicative of the general trend of thiamine, riboflavin, pantothenic acid, and niacin contents in flours of increasing extraction. These curves indicate that extended extraction produces large increases in thiamine but only relatively minor changes in riboflavin and niacin contents.

The effects of pantothenic acid and inositol added to whole wheat bread on evacuation time, digestion, and absorption in the upper gastrointestinal tract of dogs, C. G. Bly, F. W. Heggeness, and E. S. Nasset (*Jour. Nutr., 26 (1943), No. 2, pp. 161–173, illus. 2*).—By procedures similar to those previously employed by Russell and Nasset (E. S. R., 88, p. 135), jejunostomized dogs were brought to a condition of severe deficiency by maintaining them for 2–3 mo. on a diet consisting exclusively of a peeled-wheat bread. At this stage the dogs exhibited about a 50 percent decrease in gastrointestinal motility, accompanied by 40–60 percent decreases in the rates of carbohydrate and protein digestion and absorption. Calcium pantothenate added to the diet at the rate of 220 μg. per kilogram of dog weight per day caused an almost immediate return of these functions to normal. The total digestion and absorption remained practically the same in the normal and deficient states. Pyridoxine supplementation did not alter the course of the deficiency. Inositol temporarily improved the motility due apparently to a cathartic action, but greatly decreased the total amounts of digestion and absorption. Any synergism between inositol and pantothenic acid was not confirmed by this method. In 5 or 6 mo. a secondary deficiency appeared, characterized by diminished effectiveness of the pantothenic acid supplements. Adding a salt supplement together with the continued pantothenic acid supplement resulted in a prompt return of the motility to normal but only in very slight improvements in digestion and absorption rates.

Vitamin content of prepared cereal foods, G. Kitzes and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Amer. Med. Assoc., 123 (1943), No. 14, pp. 902–903*).—This preliminary report presents data on the thiamine, riboflavin, and niacin content, determined by methods noted, of certain prepared cereal foods (designated by trade names and manufacturers), some of which were vitamin-enriched and 34 of which are classified as products derived largely from wheat, 4 from corn, 6 from oats, 4 from rice, and 9 as miscellaneous products. It is pointed out that the values reported may not necessarily be typical since they are based on a limited number of analyses of each product, the samples of which were purchased from local markets in the spring and early summer of 1943.

A study of some of the vitamin B-complex factors in rice and its milled products, V. R. Williams, W. C. Knox, and E. A. Fieger. (La. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 5, pp. 560–563*).—Samples of brown rice of six varieties (Blue Rose, Fortuna, Early Prolific, Nira, Rexora, and American Pearl) and samples of milled fractions of three varieties (Blue Rose, Early Prolific, and Fortuna) were collected from 13 Louisiana mills and 1 Arkansas mill during the height of the 1942–43 milling season, and were analyzed for their content of thiamine, pantothenic acid, nicotinic acid, and pyridoxine. The data, reported by varieties, indicated no significant differences in the vitamin content of the different varieties, although the long-grain rices, such as Nira and Fortuna, tended to be highest in vitamin content, and the shorter-grained varieties, Early Prolific and American Pearl, to be lowest. In the brown rice of the six varieties, the thiamine, nicotinic acid, panthothenic acid, and pyridoxine averaged, respectively, 4.3, 46.2, 16.4, and

10.3 μg. per gram of dry weight. In the milling process, more and more of the outer coats of the rice grain were removed as the rice progressed from the original rough state through the fractions designated as brown rice, first-break rice, second-break rice, brushed rice, and finished rice. Analyses of these fractions showed the greatest drop in vitamin content to appear at the first-break, the thiamine, nicotinic acid, pantothenic acid, and pyridoxine content of this fraction averaging, respectively, 1.7, 25.8, 9.1, and 6.9 μg. per gram of dry weight; in the finished rice the corresponding vitamin values were 0.8, 12.7, 6.4, and 4.5 μg. per gram of dry weight. In the bran these vitamins averaged 27.9, 408.6, 71.3, and 32.1μg. per gram of dry weight, respectively, and in the rice polish the corresponding averages were 23.3, 384.7, 92.5, and 30.8 μg. per gram, respectively.

The influence of processing on the thiamin, riboflavin, and niacin content of rice, M. C. Kik and F. B. Van Landingham. (Ark. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 5, pp. 569–572*).—The influence of processing rice according to the principles of the patented (British) H. R. Rice Conversion method was observed in six samples, three of which were from the same lot of the Early Prolific variety and were processed in the laboratory; two of which were from different lots of the Rexora variety and were processed on pilot plant scale at a plant in Houston, Tex.; and one of which was of the Nira variety, processed in the manufacturing plant of the Houston company. In general, the conversion process involved cleaning the rice with cold water, successive exposure of the wet grains to vacuum, hot water under pressure, and steam, followed by drying and milling. Analyses of the nonmilled, converted milled, and unconverted milled samples for thiamine, riboflavin, and nicotinic acid indicated that the conversion process favored the retention of these vitamins. Thus, by the old method of milling, thiamin retention in the several samples ranged from 11 to 22 percent, riboflavin retention from 35 to 60 percent, and niacin retention from 27 to 46 percent. By the new conversion method, on the other hand, the retentions in the six samples ranged from 51 to 77 percent for thiamin, 52 to 78 for riboflavin, and 60 to 88 percent for niacin. Determinations of these three vitamins in rice hulls and bran before and after conversion indicated that the vitamins were lost from these grain layers in the conversion process.

Riboflavin in products of commercial rice milling and thiamin and riboflavin in rice varieties, M. C. Kik and F. B. Van Landingham. (Ark. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 5, pp. 563–569*).—Products of commercial rice milling previously analyzed for thiamine (E. S. R., 90, p. 134) were analyzed for riboflavin by the thiochrome method of Conner and Straub (E. S. R., 87, p. 148). The data reported for the varieties analyzed, namely, Supreme Blue Rose, Early Prolific, Fortuna, and Lady Wright, grown in Arkansas, and Improved Blue Rose, grown in Louisiana, showed that, on an average, 50 percent of the riboflavin was lost during the rice-milling process. "Of the finished clean products, the end-product head rice (sold for human consumption) contained an average of 0.26 μg. and second head 0.25 μg. per gram of dry matter. Screenings and brewers' rice contained 0.34 and 0.36 μg. riboflavin, respectively. These differences are too small to be of any significance. Of the byproducts, hulls contained 0.76 μg., bran from 1.37 to 3.33 μg. per gram, and rice polish 1.14 to 1.87 μg. per gram." Three samples of milled parboiled rice, prepared in three different places from the varieties Nira, Caloro, and Indian, contained, respectively, 0.47, 0.33, and 0.30 μg. of riboflavin per gram of dry material; the corresponding milled nonparboiled sample of Nira variety contained 0.30 μg. per gram. Two different samples of undermilled rice, Lady Wright and Supreme Blue Rose varieties, contained 0.28 and 0.32 μg., compared with 0.19 and 0.25 μg. per gram in the milled rice. Forty samples of paddy or rough rice of the harvest of 1941, representing 18 varieties from four different States (Arkansas, Louisiana, Texas, California) averaged 3.85 μg. of thiamine (range, 2.63–5.06 μg.) and 0.59 μg. of riboflavin (range, 0.43–0.83 μg.) per gram.

The value of dairy products in nutrition.—III, The riboflavin, pantothenic acid, nicotinic acid, and biotin content of several varieties of cheese, R. A. SULLIVAN, E. BLOOM, and J. JARMOL (*Jour. Nutr., 25 (1943), No. 5, pp. 463–470*).—In continuation of this series (E. S. R., 88, p. 378), 12 different types of cheese were analyzed for riboflavin by the procedure of Snell and Strong (E. S. R., 82, p. 587), pantothenic acid by the method of Pennington et al. (E. S. R., 85, p. 442), nicotinic acid by the method of Snell and Wright (E. S. R., 87, p. 12)—all three of these procedures slightly modified as to basal media—and for biotin by the procedure of Shull et al. (E. S. R., 87, p. 626). The samples represented market varieties and included 4 processed cheeses, 1 dried grated product, and the others natural cheeses including a domestic blue cheese prepared from cow's milk. In Limburger cheese sampled at various stages of the ripening process, riboflavin was found to vary but little from the green curd to the fully ripened cheese, but the other three vitamins showed a definite increase due to the growth of yeasts and bacteria.

Destruction of riboflavin in milk by sunlight, W. J. PETERSON, F. M. HAIG, and A. O. SHAW. (N. C. Expt. Sta.). (*Jour. Amer. Chem. Soc., 66 (1944), No. 4, pp. 662–663*).—Fresh milk, bottled in standard-type pint milk bottles with the usual type cap, was exposed from midmorning to midafternoon to direct sunlight on an open porch. Riboflavin, estimated fluorometrically with the Coleman electronic photometer, essentially by the method of Hand, was determined before and at intervals after exposure in tests on 4 separate days, involving samples from 10 different cows. Atmospheric temperatures to which the samples were exposed were between 60° and 72° F. "The mean loss of riboflavin in 60 min. was 0.69γ. The standard error of this loss based on the variation in loss from series to series was 0.055γ. Observed losses of riboflavin at exposure intervals of 30, 90, 120, and 210 min. were, respectively, 28, 50, 66, and 72 percent.

"Control samples of milks used in the study showed no loss of riboflavin when stored in the dark at room temperature for 24 hr., nor did any loss occur when they were stored in a refrigerator for 7 days. In order to determine whether an initial exposure to sunlight would stimulate a more rapid decrease when samples were subsequently placed in the dark under refrigeration, three samples (1.54γ per cubic centimeter) were placed in the refrigerator after ½, 1, 3, and 5 hr. of exposure. After 48 hr., the additional loss which had taken place was extremely small, averaging 0.016γ and in no case exceeding 0.07γ.

"It is evident that the destruction of riboflavin in milk by sunlight proceeds at a very rapid rate, even at ordinary temperatures."

Nicotinic acid requirements of certain yeasts, M. ROGOSA. (U. S. D. A.). (*Jour. Bact., 46 (1943), No. 5, pp. 435–440, illus. 2*).—Seven strains of *Saccharomyces cerevisiae* which do not ferment lactose and 114 strains of lactose-fermenting yeasts were used in this study in which the growth response of the organisms to two parallel sets of media, one containing adequate nicotinic acid and one free from nicotinic acid, was observed. Serial transfer technics were employed in addition to washed-cell technics, and measurements of growth responses were made photometrically by means of a photoelectric photometer. The results indicated consistently that yeasts which do not ferment lactose do not require an exogenous source of nicotinic acid for growth, whereas lactose-fermenting yeasts do require an exogenous source of nicotinic acid for growth.

The thiamin content of Canadian hard red spring wheat varieties, A. G. O. WHITESIDE and S. H. JACKSON (*Cereal Chem., 20 (1943), No. 5, pp. 542–551, illus. 1*).—Data on weight per bushel, weight per 1,000 kernels, percentage protein, and International Units of thiamine per pound are presented for a series of composite samples representing 1,167 original samples from the 1940 crop and 21 different crop districts. In another group samples from five Canadian experimental stations for

1940 and 1941 are compared. A statistical study of these data for thiamine and of similar values reported for the 1939–40 crop showed that, for the varieties tested, significant differences existed between varieties. Thus, Regent, Renown, and Reward could be expected to be higher in thiamine than Red Bobs, Thatcher, Marquis, and Garnet. Regent, for example, representing samples drawn from 158 places in Manitoba, Saskatchewan, and Alberta in 1939 and from 163 places in 1940, averaged 829 I. U. of thiamine per pound as compared with 707 I. U. per pound for corresponding samples of Thatcher. The varieties arranged themselves in the same order for both years. Environment was also shown to influence the level of thiamine to be expected for wheat from different locations in the same year. "The thiamine content of wheat appears to be associated with the development of the wheat kernel, as negative correlations were obtained between thiamine and test weight per bushel and between thiamine and weight per 1,000 kernels. Positive correlations were obtained between thiamine and protein. It was calculated that approximately 60 percent of the variability in thiamine was accounted for by its association with protein, kernel weight, and bushel weight; with protein and kernel weight; with protein and bushel weight; and with kernel weight and bushel weight. The use of any one of these characters for predicting thiamine content in wheat varieties would appear to be limited."

The effect of salicylates (A) on the estimation of thiamine by the thiochrome method, (B) on the excretion of thiamine, J. B. Cleland (*Austral. Jour. Expt. Biol. and Med. Sci., 21 (1943), No. 3, pp. 153–158, illus. 1*).—The presence of salicylates in urine interferes with the determination of thiamine by the thiochrome method since salicylates give a blue fluorescence in ultraviolet light. Strong acidification of the urine with concentrated HCl preliminary to extraction with isobutanol permits removal of salicylates as well as other interfering fluorescent compounds in the extract. Evidence is presented from a number of case reports to show that salicylates administered over short periods increase the excretion of thiamine in urine, but long periods of therapy cause a reduced output. The significance of these results in the interpretation of the thiamine excretion test is discussed. It is suggested that a high thiamine intake is advisable during salicylate therapy.

Ascorbic acid content of recently harvested cereals and legumes, M. N. Rudra (*Nature [London], 152 (1943), No. 3846, p. 78*).—The occurrence of ascorbic acid is reported in ground roasted Bengal gram (*Cicer arietinum*), whole oatmeal, and whole-wheat flour, all from seeds grown in India, harvested in March to April, and analyzed in May. The respective ascorbic acid values obtained by dye titration were 10.31, 13.97, and 5.30 mg. per gram. These values were confirmed by biological assay with young growing guinea pigs.

Fresh limas good source of vitamin C if not overcooked, L. McWhirter (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 4, p. 6*).—Two varieties of lima beans (Henderson Bush lima and Carolina Sievas, a pole variety) were found to average, respectively, 37 and 40 mg. ascorbic acid per 100 gm. as fresh raw beans, 30 and 37 mg. per 100 gm. of cooked beans after cooking 30 min., and only 15 and 19 mg. per 100 gm. after cooking for 3 hr. The cooking water was analyzed with the beans. The results indicate how vitamin losses are increased by overcooking, and that the beans cooked by recommended procedures (dropping beans into boiling water, cooking for 30 min., and serving cooked beans with their cooking liquor) may supply in an average serving (about 70 gm.) as much as 25 percent of the daily vitamin C requirement.

Vitamin C in apples and other materials, O. H. Keys (*New Zeal. Jour. Sci. and Technol., 24 (1942), No. 3B, pp. 146B–148B*).—Ascorbic acid in apples, determined by dye titration of a metaphosphoric acid extract of the fruit, was found

to vary chiefly according to variety, but within one variety to vary with season and place of growth. Of the apples grown commercially in New Zealand, the Sturmer variety contained much more of the vitamin than the others. The peeled flesh of this variety contained from 11 to 19 mg. ascorbic acid per 100 gm., and did not suffer appreciable loss of the vitamin on cool storage for several months. Other varieties examined—Docherty, Statesman, Delicious, and Coxorange—contained from 2.0 to 3.6 mg. per 100 gm., although samples of Coxorange direct from the tree had an average of 8.3 mg. per 100 gm. Chinese gooseberries (*Actinidia chinensis*) contained 100 mg. ascorbic acid per 100 gm., and the leaves of garden primrose, or polyanthus (*Primula*), were found to be exceptionally rich, containing up to 900 mg. per 100 gm. fresh weight. A solution of 0.2 M sodium hexametaphosphate in N sulfuric acid was found to be an efficient extractant and stabilizer and a satisfactory substitute for metaphosphoric acid in the method for ascorbic acid.

The influence of variety, size, and degree of ripeness upon the ascorbic acid content of peaches, G. M. SCHRODER, G. H. SATTERFIELD, and A. D. HOLMES. (Mass. Expt. Sta. et al.). (*Jour. Nutr., 25 (1943), No. 5, pp. 503–509*).—Eight common varieties of peaches grown under comparable climatic and soil conditions in commercial orchards near Raleigh, N. C., were utilized in this study involving individual analyses of 156 peaches, most of which were obtained directly from orchards and analyzed within 2 days of arrival at the laboratory. Ascorbic acid, extracted by triturating the fruit sections, mixed with pure sand, with an extraction mixture of 4 percent HPO_3–8 percent acetic acid, was determined by titration with 2,6-dichlorophenolindophenol. The concentration of ascorbic acid was found to be highest in the skin, lower in the flesh directly under the skin, and lowest in the flesh surrounding the pit. For analysis the peach was sampled by removing wedge-shaped sections extending from end to end of the peach. No correlation was found between the size of the peach and its ascorbic acid content. Ascorbic acid was lowest in hard (green) peaches and increased continuously with ripening through the stages of hard ripe (shipping), ripe, and overripe (soft). The average difference in ascorbic acid content within varieties was 4.29 mg. per 100 gm. of fruit, whereas the extreme difference between varieties was 9.02 mg. per 100 gm. The average ascorbic acid content of the ripe peaches was as follows for the varieties tested: Augbert 3.84 mg., Elberta 5.25, Mayflower 5.34, Golden Jubilee 6.13, Early Rose 7.18, Early Wheeler 7.36, Carman 8.82, and Hiley Belle 12.86.

Observations of the ascorbic acid content of evaporated milk, F. J. DOAN and D. V. JOSEPHSON. (Pa. Expt. Sta.) (*Jour. Dairy Sci., 26 (1943), No. 11, pp. 1031–1041, illus. 1*).—Evaporated milk from 27 plants located in all sections of the country was obtained in four series of samples supplied in triplicate in April and December 1940 and June and October 1941. One sample of each set was examined when received, one after 3 months' storage at room temperature, and one after 5 or 6 mo. from date of manufacture. For analysis the milks were reconstituted to the fluid basis by dilution with an equal volume of recently boiled distilled water. Direct titration of the reconstituted milk with 2,6-dichlorobenzenoneindophenol dye according to the method of Sharp (E. S. R., 79, p. 152) gave values for total reducing substance much higher than would be found for fresh fluid milk. More than 85 percent of this reducing ability was due to spurious reducing substances formed during sterilization. These were totally removed, along with the protein, by precipitation with a solution of 6 percent trichloroacetic acid and 4 percent metaphosphoric acid followed by filtering. Titration of the serum thus obtained gave values for reduced ascorbic acid which reached a maximum of 10 mg./l. of reconstituted evaporated milk but averaged only 4.1 mg./l., which represented a loss of more than 75 percent from the average amount in freshly drawn fluid milk. The values for reduced ascorbic acid in the evaporated milks manufactured in spring and early

summer (April, June) were higher than the values for the samples manufactured in fall and early winter (October, December) and were also higher in the evaporated milks manufactured in northern plants than in similar milks manufactured in plants in the southern section of the country.

The H_2S method for determining dehydroascorbic acid in milk gave erratic results that tended to run about 1 mg. higher than values obtained by the bacteriological technic of Gunsalus and Hand (E. S. R., 87, p. 623). Determinations by the latter procedure indicated a dehydroascorbic acid of 0.0–1.8 mg./l., an amount too low to be nutritionally significant. The amount and stability of ascorbic acid in the evaporated milk bore no relation to the Cu content, which varied on a reconstituted basis from 0.36 to 2.60 p. p. m.; there likewise appeared to be no relation to the metallic nature of the equipment or to the manufacturing processes used. The greatest loss of ascorbic acid apparently took place before, during, and immediately after the manufacture of evaporated milk, the loss being gradual in the first 2 mo. and negligible thereafter. Spangling or etching of the tin of evaporated milk cans was invariably observable after 2 mo. of storage. The degree of spangling was inversely correlated with the Cu content of the milk. The pH of evaporated milk decreased during storage, but milk manufactured in the spring and summer appeared to be slightly better buffered than that made in the fall and winter.

Decomposition of vitamin C by bacteria, R. M. Young and L. F. Rettger (*Jour. Bact., 46 (1943), No. 4, pp. 351–363*).—The vitamin C decomposing ability of various bacterial species in the order Eubacteriales was studied, using an ascorbic acid nutrient broth with or without the addition of various carbohydrates to a final concentration of 1 percent. The property of decomposing ascorbic acid was found to be quite common among the enteric bacteria, *Proteus morgani* and members of the following genera having been found capable of oxidizing the vitamin: *Escherichia, Aerobacter, Salmonella, Eberthella, Streptococcus* (enterococci), *Streptococcus* (hemolytic), *Encapsulatus,* and *Vibrio.* In the presence of appreciable amounts of easily fermented carbohydrate, like glucose, the vitamin was protected from microbic decomposition, whereas in the absence of the competitive agents the ascorbic acid content of the medium was rapidly depleted. When the procedure was carried out in anaerobic jars the bacterial decomposition of the ascorbic acid still occurred. Bacteria which do not attack the vitamin exerted a sparing action on it under ordinary aerobic conditions by removing atmospheric oxygen. The presence of the vitamin favored the growth of the organisms. Those that utilized the ascorbic acid as a carbon food attacked it readily in the presence of a suitable source of organic nitrogen, like peptone. In the absence of a suitable nitrogen source, however, no growth occurred, and the cells were killed. The oxidizing bacteria carried the oxidation of the ascorbic acid beyond the dehydro stage, and if these bacteria produced gas from ordinary carbohydrates, they also caused gas formation in their action upon ascorbic acid. Filtrates of active bacterial cultures did not cause decomposition of the vitamin C. The significance of the findings of this study in relation to vitamin C destruction by bacterial action in the intestinal canal is discussed.

Anti-rachitic activity of vitamin D_3-precursors in the rat, S. Lassen and E. Geiger (*Soc. Expt. Biol. and Med. Proc., 53 (1943), No. 2, pp. 181–183*).—7-Hydroxycholesterol, when given subcutaneously to rats that were subsequently exposed to ultraviolet irradiation, was found to have a higher antirachitic effect than 7-dehydrocholesterol injected into rats subsequently irradiated. Under similar conditions of injection and irradiation, 7-ketocholesterol had an equal or higher antirachitic effect than 7-dehydrocholesterol. The per os introduction of 7-ketocholesterol, 7-hydroxycholesterol, and 7-dehydrocholesterol into rats subsequently irradiated produced a lesser antirachitic effect than subcutaneous injection of similar amounts of sterols under otherwise identical conditions. There was no essential

difference in the curative effect of activated 7-dehydrocholesterol, whether it was given to rats subcutaneously or per os.

A study of the antirachitic effect of fat on rats receiving high calcium-low phosphorus rachitogenic diets, R. G. Booth, K. M. Henry, and S. K. Kon (*Biochem. Jour., 36 (1942), No. 5–6, pp. 445–455*).—A diet composed of 20 parts of refined semihardened peanut oil and 80 parts of a rachitogenic diet—either that of Steenbock and Black (E. S. R., 54, p. 489) supplemented with extra $CaCO_3$, or that of Gridgeman (E. S. R., 83, p. 571)—permitted better bone calcification in rachitic rats than the rachitic diet diluted with sufficient starch to make it isocaloric with the fat-diluted diet. Triglycerides resynthesized from the fatty acids of butter or peanut oil, from which the nonsaponifiable residue had been carefully removed, when used in place of the semihardened peanut oil (with the Steenbock and Black diet) also exerted a definite antirachitic effect. In these fat-supplemented diets, the Ca : P ratio was approximately 4 : 1 or 5 : 1, with Ca levels ranging from 0.961-1.089 per cent and P levels from 0.203—0.261 percent. On a high Ca : low P diet (about 13 : 1) containing 25 percent peanut oil and nearly all the P from inorganic phosphate, rather than from cereal or cereal and meat as in the above diets, calcification of rachitic rat bones was significantly better than with a similar diet containing only 5 percent of the oil but supplying in equicaloric amounts the same quantities of Ca and P. The resynthesized triglycerides of lard and of coconut, olive, linseed and soybean oils were also shown to have a calcifying effect. Fat exerted no calcifying effect when added to a high P : low Ca diet. The metabolic study of the effects of fat on the assimilation of Ca and P from a high Ca : low P rachitogenic diet showed that the fat, as compared with an equicaloric addition of starch, lowered the fecal excretion of P and the urinary excretion of Ca. "It is concluded that the fat effect is qualitatively different from that of vitamin D, but that it requires further elucidation."

The vitamin D content of English butter fat throughout the year, K. M. Henry and S. K. Kon (*Biochem. Jour., 36 (1942), No. 5–6, pp. 456–459, illus. 1*).—The vitamin D potencies of the fat of butter churned at approximately monthly intervals from the milk of a typical south-of-England herd were measured between March 1940 and March 1941. The herd averaged 6 Guernseys and 41 Shorthorns in various stages of lactation, and the cows were out by day throughout the year and out day and night from April 26 to November 8. The assay was done by the prophylactic bone-ash method against the International Standard, on groups of 11 or 12 rats, all comparisons being between litter mates. Since butterfat itself had been shown to exert an antirachitic action (see above) which would be particularly noticeable with low-potency butter, errors from this effect were avoided by saponifying the butter and using the non saponifiable residue for the tests. On four occasions simultaneous determinations were also made on untreated fat.

The values for the nonsaponifiable residue varied from less than 0.1 International Unit per gram of fat in the months of November to March to 0.55 in July, and 0.97 I.U. per gram in August. Sunshine records obtained for the area in which the herd was kept revealed, on the whole, good correlation between the vitamin-D content of the butter and the amount of sunshine to which the cows were exposed. The values for the untreated fat were invariably higher than those measured after saponification, the difference being much more marked in winter than in summer; this was expected because of the antirachitic effect of the fat itself, which was fed in relatively larger amounts in the low-potency winter butter.

The effect of vitamin D on calcium retentions, H. McKay, M. B. Patton, M. S. Pittman, G. Stearns, and N. Edelblute. (Ohio and Kans. Expt. Stas. et al.). (*Jour. Nutr., 26 (1943), No. 2, pp. 153–159*).—This report, presented as paper No. 19 of the Regional Project of the North Central States Relating to the Nutri-

tional Status of College Women, is concerned with the effect of vitamin D supplements on the retention of calcium from a well-selected basal diet supplemented daily by 250, 500, and 750 cc. of milk, respectively, for each of three collection periods of 10 days each. Six subjects previously maintained on this diet (E. S. R., 88, p. 852) were returned to the 250 cc. milk level for the beginning of the experiment and were given in addition a daily supplement of 500 International Units of vitamin D, one subject remaining on the regime for one 10-day period, the other five for three 10-day periods each. At mean daily calcium-intake levels of less than 0.8 gm. the vitamin D failed to improve calcium retention; at levels above 0.8 gm. there was some evidence of improved retention of calcium, but the improvement was so slight that it was not statistically significant. For one subject the mean calcium retention during each of the vitamin D periods was greater than the mean retention during corresponding periods when no vitamin D was given. The difference between the two mean retention figures was not significant, however. "It is concluded that the addition of approximately 500 I. U. of vitamin D to diets which were well-selected had little influence upon the calcium retention, and that the well-selected diet provides for the vitamin D needs of the young adult."

TEXTILES AND CLOTHING

Impact testing of textiles, H. Leaderman (*Textile Res., 13 (1943), No. 8, pp. 21–29, illus. 4*).—In the commonly used tensile test, in which the tensile load to break the specimen is measured, the load is applied fairly slowly. However, this does not represent the condition prevailing when fabrics are subjected to shock loads as in the case of tire cords and parachute fabric, for example. For testing the performance of fabrics under shock loads an impact test, which is essentially a tensile test carried out at a very rapid rate, is more representative of service conditions. "Impact tests on textiles should be carried out preferably at a constant velocity of deformation. This can be effected easily with a freely falling weight arrangement. By means of an electrical-resistance 'weigh-bar' the tension in the specimen as a function of extension can be obtained. In this way the yield-point, breaking load, ultimate extension, and work to rupture under impact conditions may be determined. Comparison of these data with corresponding data obtained at constant rate of stretch at usual testing speeds will show the effects of high rates of stretch on the mechanical properties of textiles."

The scale substance of wool, W. B. Geiger (*Textile Res., 14 (1944), No. 3, pp. 82–85, illus. 2; also in Amer. Dyestuff Rptr., 33 (1944), No. 6, pp. 117–118*).—Recent work (E. S. R., 86, p. 569) showed that wools chemically modified by reduction with thioglycolic acid followed by alkylation with methyl iodide or ethyl bromide are attacked by pepsin, which dissolves the inner portions of the fiber, leaving the scaly outer layer, the cuticle, intact. Scale material prepared in this way formed, when washed and dried, a light-brown horny mass which represented about 2.3 percent of the weight of the wool. This material was subjected to certain preliminary qualitative tests which indicated that it was composed largely of protein and that this protein contained tyrosine or tryptophan, arginine, and sulfur, that carbohydrate was probably absent, and that about 2.7 percent of lipid and 4.13 percent of ash were present. Further analysis indicated that the protein of the scale material contained the same amino acids as the protein of wool, although the proportions differed in the two materials; the scale material contained, in particular, less arginine, less tyrosine, about the same amount of serine and considerably more sulfur and ash than the untreated wool.

Nylon: A literature survey, M. C. Sigel (*New York 16: Textile Res. Inst., [1943], pp. [13]*).—This report, based on a survey of scientific, technical, and

general literature on the subject, presents compiled data on tenacity; elongation; chemical stability; solubility; thermal, optical, and electrical properties; and hygroscopity of nylon. Included in the survey is a list of the journals consulted, with abstracts of pertinent articles.

Making a dress at home, M. SMITH (*U. S. Dept. Agr., Farmers' Bul. 1954 (1944), pp. 24, illus. 39*).—This concise sewing guide gives a step-by-step summary of the things that must be done, from selection of patterns and choice of material through the various stages of cutting, constructing, pressing, fitting and finishing of the dress. Many details in the order in which they should be considered are presented to save the beginner from pitfalls.

HOME MANAGEMENT AND EQUIPMENT

Rural housing: A selected list of references prepared for postwar planning groups in the Great Plains region, M. E. WHEELER (*U. S. Dept. Agr. Libr., Lincoln Branch, Nebr., 1944, pp. 28+*).—This annotated bibliography, prepared for postwar planning groups in the Great Plains region, is classified under the headings bibliographies, general, census, cost and standard of living, financing, foreign legislation and experience, housing standards, index and scales, and landscaping. The section on housing standards includes references to plans for dwellings and farm structures, materials, and modern conveniences.

REPORTS AND PROCEEDINGS

Farm science at war: Fifty-sixth Annual Report, 1942–43, Colorado Agricultural Experiment Station, H. J. HENNEY (*Colorado Sta. Rpt. 1943, pp. 40, illus. 8*).—Findings from the work in agronomy (among them notes on alfalfa and barley breeding, soil nutrients, and tests of possible rubber-source plants); animal investigations, including sorghums for beef production, pasture and pea-vine silage for dairy cows, and feeding beet tops to lambs; botany and plant pathology; chemistry, including mineral tolerance in livestock drinking waters; entomology, including work with the spider beetle, hessian fly, control of cattle lice and ants, psyllid resistance and control, horse- v. tractor-drawn sprayers, and peach mosaic; home economics, including field- v. trench-stored carrots and value of tender sugar beet tops at harvesttime; horticulture, including bacterial ring rot of potatoes and disinfection of seed-potato cutting knives, tests of elements increasing skin color of potatoes (Cu, Fe, Zn, and Mn), fruit rot of tomatoes; pathology and bacteriology, including notes on urinary calculi, enterotoxemia, and fringed tapeworms in lambs, listerellosis in ewes, mycotic stomatitis in cattle, and pullorum disease in turkeys; poultry, including iodine requirements, carotene and riboflavin content of alfalfa and sprouted grains, sources of protein for poultry, granular v. fine ground alfalfa hay, and factors influencing reproduction and hatchability in turkeys; range and pasture management, including induced revegetation and artificial reseeding, improved range practices, nutritive values of native range forage plants, and the railing of sagebrush; rural economics and sociology; engineering (noted on p. 471); and potato storage.

Annual report of the director [of Delaware Station], 1943, G. L. SCHUSTER (*Delaware Sta. Bul. 244 (1943), pp. 44*).—The activities of the year are briefly summarized for the departments of agricultural economics, agronomy, animal and poultry industry, chemistry, entomology, horticulture, and plant pathology.

Fifty-sixth Annual Report [of Cornell Station], 1943, C. E. LADD ET AL. ([*New York*] *Cornell Sta. Rpt. 1943, pp. 79-173*).—In addition to work noted elsewhere in this issue, this section of the report deals with the progress of investigations in agricultural economics, including an economic study of up-State New

York regional markets, a farm management study of about 500 dairy farms in 5 areas, land utilization, and milk processing and delivery costs; agronomy, including birdsfoot-trefoil investigations, and the fate of small and of large quantities of nitrogen applied to a cropped soil; animal husbandry, including the effect of different levels of dietary fat on milk and fat production, the availability of the calcium and phosphorus of defluorinated rock phosphates for the mineral nutrition of animals, the nutritive value for farm animals of the protein furnished by urea and other feeds, vitamins in stored semen and effect of dilution with yolk citrate on fertility in artificial insemination, value of various concentrate mixtures for dairy cows in milk, improvement of the Cornell calf starter, relative effectiveness of the combined copper sulfate-nicotine sulfate solution and phenothiazine for control of worm parasites of the digestive tract of sheep and lambs, protein supplements for fattening lambs, and protein and vitamin supplements for growing and fattening pigs; botany, including toxicity to insects of *Amorpha fruiticosa* and *Tephrosia virginiana,* koksaghyz, goldenrod, and other plants as sources of rubber, vanilla hybrids, effect of time of day at which alfalfa is cut on nutritive value, and requirements for storage and germination of *Scirpus* spp.; dairy industry, including studies of lactic acid bacteria; entomology and limnology, including baits for the alfalfa snout beetle, sprays and dusts for control of ample insects, history and control of the squash bug, seed corn maggot, potato insects, onion thrips, Japanese beetle, and holly leaf miner; floriculture, including watering roses and carnations and winter protection of roses; storage of red oak acorns; plant breeding, including breeding and genetics of wheat, oats, barley, corn, rye, soybeans and clovers; plant pathology, including mosaic-immune pea beans, control of onion smut, potato yellow dwarf, effect of fertilizers on scab and Rhizoctonia of potatoes, and summer fungicides for apples; pomology, including soil factors associated with yield and behavior of fruit crops, rate of photosynthetic activity, response of apples to nitrogen, natural v. controlled pollination in orchards, and the efficiency of oiled wraps and waxes in control of apple scald and shriveling; poultry husbandry, including the R and S components of the vitamin B complex, the role of pantothenic acid in hatchability, value of soybean meal in the poultry ration, organic factors required for prevention of perosis, pasture and silage for poultry, and influence of illumination and temperature on semen production and growth; vegetable crops, including fertilizer requirements, green manures and cover crops, handling and storage, land utilization, factors affecting composition and culinary quality, and lettuce improvement; and zoology, including zinc phosphide as a ratacide and the cyclic nature of field mouse population.

Informe bienal, años fiscales 1941 y 1942 [Biennial Report of the Puerto Rico University Station, 1941–42], J. A. B. NOLLA ET AL. (*Puerto Rico Univ. Sta. Rpt. 1941-42, Span. ed., pp. 105+, illus. 15*).—This report covers the biennium already reported on in English for each year (E. S. R., 87, p. 323; 90, p. 283).

Fifty-sixth Annual Report of the Vermont Agricultural Experiment Station for the year 1942–43, H. R. VARNEY (*Vermont Sta. Bul. 508 (1943), pp. 38, illus. 5*).—This report gives "a brief description of each live project and a summary of the work done upon it during the year." The projects deal with soils and fertilizers, including effect of amendments on the conservation of cattle manure, effect of lime and organic matter on boron fixation and availability in soils, and phosphorus fixation and unavailability; pasture and hay crops, including pasture and hay-land turf studies, influence of seed mixtures and fertilizers on permanent pastures, maintenance of permanent hay lands, methods of ensiling timothy, and erosion control; cultivated crops, including cause and control of potato scab, potato leaf roll, fertilization of field beans, silage corn, and potatoes, varietal tests with vegetables, and yield of seed and rubber by *Taraxacum kok-saghys;* fruit, including apple orcharding, development of an adequate orchard spray program and adaptabil-

ity of small fruits to Vermont winters; woodland crops, including tolerance of New England forest trees and forest reestablishment on abandoned areas; dairy cattle, including requirements for and utilization of feed by dairy animals, artificial insemination of dairy cows, dairy barn construction (noted on p. 474), effects of colostrum feeding on dairy calves, and dairy plant efficiency; farm fires; farm labor efficiency; and cross-breeding of violets.

MISCELLANEOUS

Minnesota Farm and Home Science, [May 15, 1944] (*Minn. Farm and Home Sci.* [*Minnesota Sta.*] *1 (1944), No. 3, pp. 16, illus. 22*).—In addition to articles noted elsewhere in this issue, this number contains A Blind Spot in Minnesota Education, by L. Nelson (pp. 4–5), an indictment of rural attendance in secondary schools; The Respiratory Diseases of Chickens, by R. Fenstermacher (pp. 5–7), a discussion of infectious bronchitis of chicks, bronchitis, coryza, laryngotracheitis, and fowl pox; Suggests Better Way to Pay for Skim Milk, by S. T. Coulter (p. 7), based on Wisconsin Station Research Bulletin 143 (E. S. R., 87, p. 293); and Research Is a Continuing Process, by C. H. Bailey (p. 16).

Mississippi Farm Research, [April 1944] (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 4, pp. 8, illus. 10*).—In addition to articles noted elsewhere in this issue, this number contains the following: The Cotton Outlook, by D. G. Miley (pp. 1, 8); Mailing List for *Farm Research* to Be Expanded, by P. H. Sanders (pp. 1, 6); Fruit Thinning Timely This Year, by T. H. Jones (p. 2); Economic Problems in Mississippi and the South, by F. J. Welch (pp. 3-4, 6), also to be issued as a station circular; Treatment of Calf Scours, by W. C. Cowsert (p. 8); and March Rainfall Exceeded Only Six Times Since 1889, by R. Woodburn (p. 8).

NOTES

Arkansas University and Station.—J. L. Bowers, instructor in horticulture and assistant horticulturist, has resigned to accept a position with the Mississippi Station. W. A. Faught has been appointed instructor in rural economics.

Connecticut [New Haven] Station.—Dr. George A. Zentmyer, assistant plant pathologist, has resigned to accept a similar position in the California Citrus Station vice William T. Horne deceased. Dr. Stuart B. Le Compte, Jr., plant physiologist at the Tobacco Substation, has accepted a commercial position in Hartford. John T. Ashworth, deputy in charge of gypsy moth control, retired July 1, ending a service on that staff of 27 years.

Iowa College.—Dr. L. A. Underkofler, assistant professor of chemistry, has been granted leave of absence to undertake research on the production of mold bran, a malt substitute. Dr. Margaret A. Ohlson, associate professor of foods and nutrition, has resigned to become head of the department of foods and nutrition at the Michigan College.

Kansas College.—Clara Willis Call, wife of Dean and Director L. E. Call, died July 17 at the age of 62 years. A graduate of the college in home economics in 1908, she had been a member of its instruction staff until 1910 and of that of Purdue University in 1912.

Kentucky Station.—Dr. Harrison Garman, head of the department of entomology and botany from 1889 to his retirement in 1929 and State entomologist from 1897 to 1929, died August 7. Born in Illinois on December 26, 1858, he had also served as associate professor of zoology in the University of Illinois. He was president of the American Association of Economic Entomologists in 1905.

Michigan College and Station.—A new plan of college organization became effective July 1. Four former divisions—agronomy, engineering, home economics, and veterinary medicine—are now called colleges and directed by their former heads as deans. A School of Science and Arts and a School of Business and Public Service are also established and a new Basic College is set up, the last-named to handle a 2-year educational program with comprehensive courses on written and spoken English, biological science, social science, origin and development of civilization, literature and fine arts, physical science, and effective living. All of these subjects will be required of freshman students entering this fall, and these requirements must be met before specialization in other subjects can be begun. Howard C. Rather has been appointed dean of this school and has been succeeded as head of the farm crops department by R. E. Decker, previously assistant director of extension.

Rachel Markwell has been appointed home demonstration leader vice Edna V. Smith, retired. H. A. Berg has been appointed assistant director of extension and Dr. Clive R. Megee, assistant dean of agriculture. Dr. Thelma E. Porter has resigned as professor and head of foods and nutrition to become head of the department of home economics in the University of Chicago. Dr. E. A. Bessey retired July 1 as dean of the graduate school but continues as head of the department of botany. He has been succeeded as dean by Dr. R. C. Hutson.

Montana College and Station.—The station has completed negotiations for the purchase of 143 acres of land adjoining the college campus. This will be used for experimental work by the departments of animal industry, agronomy, and horticulture, and the veterinary research laboratory.

W. O. Whitcomb, assistant professor of agronomy from 1913 to 1918 and superintendent of the Montana Grain Inspection Laboratory since 1920, died June 11 in his sixty-fourth year. A native of North Dakota, he was a graduate of the North Dakota College in 1909 and received the M. S. A. degree from Cornell University in 1913. He was assistant agrostologist in the U. S. Department of Agriculture from 1909 to 1912 and an investigator in State marketing for the Department in 1918–19.

Leave of absence has been granted to Harry G. Cockrum, assistant professor in rural engineering, and Carl F. Sierk, assistant professor in animal industry and range management, both to accept commissions in the United States Naval Reserve. M. H. Saunderson, professor of range economics, has resigned to return to his former position as principal range economist with the U. S. Department of Agriculture Forest Service. Mildred Hollensteiner has resigned as assistant seed analyst.

Cornell University and Station.—The death on August 5 is noted of Dr. Clyde H. Myers, professor of plant breeding from 1913 until his retirement on July 1, 1944. Born in Illinois on February 6, 1883, he received the B. S. degree from Illinois Wesleyan University in 1907, the M. S. degree from the University of Illinois in 1910, and the Ph. D. degree from Cornell in 1912. He was assistant in plant breeding in the Illinois Station from 1907 to 1910 and assistant professor in Cornell from 1912 to 1913. His investigations were largely with vegetables, including the hybridization of cabbage.

Drs. V. L. Frampton and E. M. Hildebrand, assistant professors of plant pathology, have resigned, the former to become research chemist in the Cotton Institute at Dallas, Tex., and the latter to go into commercial work.

The privilege given to the 4-H Clubs of New York State to name one of the new Liberty ships has been exercised by the selection of that of the late Dr. Carl E. Ladd (E. S. R., 89, p. 511). A plaque in the cabin of this ship will bear an inscription stating, in part, that in "a life devoted to agricultural education and as dean of New York State College of Agriculture . . . he instilled in the hearts and minds of young people, both in the classroom and through the Agricultural Extension Service of State and Nation, love and respect for the land and for the people who till the soil."

New York State Station.—In connection with studies on the fermentation of sauerkraut, the station bacteriologists have observed that a number of undesirable gram-negative, aerobic types of bacteria often present in large numbers on the leaves of cabbage brought to the kraut factory disappeared completely within 6 to 24 hr. after the cabbage had been cut up and the fermentation process had set in. That destruction of these objectionable organisms is due to some substance in the cabbage juice has now been proved by experimental work. This bactericidal action of cabbage juice is more pronounced with some varieties than others, and among a number of other vegetable juices investigated only onion juice displayed a similar effect on gram-negative bacteria. The substance in cabbage juice is largely destroyed by heat, but that of onion juice is only partially inactivated by heating the juice. The cabbage substance has proved active not only against the different gram-negative bacteria found on the surface of cabbage leaves, but also against a very common organism of sanitary significance known as *Escherichia coli* and against the food-poisoning organism *Staphylococcus aureus*.

International analysis certificates issued by the seed testing laboratory to cover seed shipments to foreign countries are proving very helpful. These certificates

give the variety name, origin of the seed and year grown, percentage of purity and germination, a list of all weed seeds found in the sample, the percentage of pure live seeds, and information on any evidence of seed-borne diseases. In 1942, more than 200 such certificates were supplied by the laboratory to cover large shipments of seeds to foreign ports. In 1943, 114 shipments carrying these certificates were made, largely through the port of New York. It is stated that they have helped to solve some very serious seed shortages in countries where the ravages of war have entirely disrupted much-needed seed supplies.

Dr. Charles M. Hamner, plant physiologist in the U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering, has been appointed assistant professor of pomology and will carry on research on the maturity, storage, and handling of nursery stocks. Robert F. Carlson has been appointed investigator in pomology to study plant propagation and nursery problems.

Robert J. McColloch, assistant chemist in the Indiana Station, has been appointed investigator in chemistry in connection with the food processing studies.

Ohio Station.—Dr. Garth W. Volk, professor of soil chemistry and soil chemist in the Alabama College and Station, has been appointed associate in agronomy.

Oklahoma College and Station.—Charles E. Sanborn, professor of entomology and entomologist from 1909 until his retirement in 1934, died in Stillwater, Okla., on July 5 at the age of 67 years. He was a native of Missouri and a graduate of the University of Kansas in 1903 (M. A. 1905). He had also served with the U. S. D. A. Bureau of Entomology from 1905–8, as acting State entomologist of Texas in 1908, and as assistant entomologist in 1908–9. Among his many studies was that establishing the transmission of anaplasmosis by horseflies.

Vermont University and Station.—Dr. George P. Burns, head of the department of botany for 34 years, has retired and has been succeeded by Dr. J. W. Marvin, assistant professor and assistant botanist. Dr. Elizabeth U. McCracken, instructor and assistant botanist, has resigned to accept a position with Wellesley College.

E. L. Ingalls retired June 30 after 30 years' service as State 4-H Club leader.

Washington College and Station.—The resignations are noted of Drs. T. W. Daniel, grazing specialist, and Carl F. Reuss, assistant professor and assistant in rural sociology, to accept positions, respectively, with the Utah College and the U. S. D. A. Bureau of Agricultural Economics. Recent appointments include Dr. Betty M. Watts, assistant professor of home economics and junior biochemist in the University of California, as associate home economist; Barnard D. Parrish, associate in agricultural economics in the Illinois Station, as assistant agricultural economist; Dr. T. J. Cunha as assistant animal husbandman; and Dr. J. L. Haddock, assistant professor and extension agronomist in the University of New Hampshire, as acting associate agronomist vice Dr. C. B. Harston, resigned to accept a commission in the United States Navy.

Association of Official Agricultural Chemists, Inc.—This association will hold its next meeting in Washington, D. C., on October 25–26.

National Research Council.—An agricultural board has been set up by the executive board of the council. The scope of its objectives is to be determined by its membership, which at this time has not been made public.

Cancelled Meetings.—Annual meetings of the American Society of Agronomy and the Soil Science Society of America, scheduled for November 15–17 in Cincinnati, Ohio, have been cancelled.

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 477 (1944), pp. 70–71*).—A blue lupine, *Lupinus angustifolius,* now produced in substantial quantities in this country, has been shown to yield—after being sprouted in darkness for 12 days—a quantity of pure asparagine the equivalent of about 9 percent of the weight of dry seed taken. This species thus compares favorably with the imported *L. albus,* which, although it yields a somewhat higher proportion, requires a longer culture period to do so.

Glutamine, the next higher homolog of asparagine, has in recent years assumed considerable importance as an essential component of certain culture media used in bacteriological investigations, but this is extremely rare. It has been found that seedlings of the common squash become notably enriched in glutamine when sprouted in darkness. The isolation of glutamine in pure form from this material proved to be unexpectedly difficult, however, and this problem is under investigation.

Ultraviolet absorption spectra of some alicyclic diketones and triketones, H. BASTRON, R. E. DAVIS, and L. W. BUTZ. (U. S. D. A.). (*Jour. Organic Chem., 8 (1943), No. 6, pp. 515–525, illus. 7*).—This paper deals with derivatives of 2-cyclohexene-1,4-dione, cyclane-1,2,4-triones, cyclane-1,3-diones, and application of the ultraviolet absorption data in structure analysis.

Glycidyl esters of aliphatic acids, E. B. KESTER, C. J. GAISER, and M. E. LAZAR. (U. S. D. A.). (*Jour. Organic Chem., 8 (1943), No. 6, pp. 550–556*).—The preparation and physical properties of glycidyl laurate, myristate, palmitate, stearate, oleate, and sebacate, and also of β-methylglycidyl myristate are described. The syntheses involved reaction of soaps with epichlorohydrin and of acid chlorides with glycidol. To these syntheses of pure compounds were added the preparation of glycidyl esters of the mixed acids of babassu, soybean, walnut, and castor oils, and of rosin.

Amorphin, a glycoside in Amorpha fruticosa L., F. ACREE, JR., M. JACOBSON, and H. L. HALLER (*Jour. Organic Chem., 8 (1943), No. 6, pp. 572–574.*)—The authors find that the seed of *Amorpha fruticosa* L., gives the color reaction in the Durham test which heretofore has been considered specific for rotenone and the rotenoids, but no compounds of this class could be isolated from them. The compound responsible for the positive reaction in the test is amorphigenin, $C_{22}H_{22}O_7$, the aglycon of the glycoside amorphin, $C_{33}H_{40}O_{16}$.

Alkaloids of the Leguminosae.—I, Survey of legumes examined for alkaloids. II, The common broom, Cytisus scoparius Link, and other species containing sparteine only. III, Alkaloids of "tree lucerne," Cytisus proliferus L. IV, Alkaloids of Spanish broom, Spartium junceum Lam. V, Alkaloids of laburnum

[1]The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

and gorse (Laburnum and Ulex) species. VI, The common blue lupin, Lupinus angustifolius L. VII, Alkaloids of the "tree lupin," Lupinus arboreus Sims., E. P. White (*New Zeal. Jour. Sci. and Technol., 25 (1943), No. 3, Sect. B, pp. 93–114*).—In the systematic study of legumes for alkaloids being made, about 210 species in 68 genera have thus far been examined. A general introduction discusses the aims of the work and indicates some of the findings reported upon in detail in the later parts of the contribution.

The chemical assay of the alkaloids of ergot, I–III, W. A. McGillivray and W. S. Metcalf (*New Zeal. Jour. Sci. and Technol., 25 (1943) No. 3, pp. 115–118, illus. 1; pp. 119–122, illus. 1; pp. 123–128, illus. 3*).—The following contributions are included:

I. *Total alkaloids in single sclerotia and bulk samples.*—In the rapid and accurate method for estimating total alkaloids in single sclerotia and bulk samples described, the usual preliminary defatting of the ergot is omitted; the alkaloids are extracted by cold ammoniacal acetone, transferred to aqueous solution, and measured colorimetrically, using a photoelectric absorptiometer.

II. *A micro-method for the estimation of ergometrine in a mixture of ergometrine and ergotoxine.*—A micromethod applicable to single sclerotia and bulk samples of ergot is described; it is not applicable in the presence of comparable amounts of other ergot alkaloids.

III. *The nature of the colour reaction with p-dimethylaminobenzaldehyde.*—The blue color produced on adding a solution of *p*-dimethylaminobenzaldehyde in H_2SO_4 to an aqueous solution of ergot alkaloids was found due to two different substances which are the products of two competing reactions. The intensity of the blue depends on the relative rates of these reactions and hence varies with the conditions. The effect of the concentrations of *p*-dimethylaminobenzaldehyde, H_2SO_4, and $FeCl_3$ on these rates of reaction, the use of other aldehydes and oxidizing agents, and the effect of diluting the blue solution are discussed.

Report of 1942–43 methods of analysis subcommittee on the determination of iron in cereal products, H. Howe (*Cereal Chem., 20 (1943), No. 5, pp. 604–606*).—In continuation of the work of this committee (E. S. R., 90, p. 6), 13 collaborators reported results on iron in the unenriched, enriched (with ferrum reductum or sodium iron pyrophosphate), and whole-wheat flours submitted for analysis by a procedure involving ashing of the samples at 550–600° C., solution of the ash in HCl, and determination of the iron with α,α′-dipyridyl. Three of the collaborators also employed the alkali fusion method. From 20 to 70 percent of the collaborators agreed within 5 percent of the mean, and 70 to 80 percent agreed within 10 percent of the mean. Poor agreement on the whole-wheat flour was traced to contamination with small pieces of metal from the milling rolls. Two of the collaborators using the alkali fusion method of preparing the samples for analysis reported results in fair agreement with those obtained by acid treatment of the ash. It is suggested that at least 30 min. be allowed for development of the dipyridyl color and that the volume of buffer may be increased to 10 cc. It is recommended that the alkaline fusion and acid treatment of the ash of cereals and cereal products be exhaustively compared, also dry v. wet ashing procedures.

The available iron in some tropical foodstuffs (Contenido férrico asimilable de algunos productos alimenticios), J. A. Goyco (*Puerto Rico Jour. Pub. Health and Trop. Med., 19 (1944), No. 3, pp. 502–504; Span., pp. 505–507*).—Thirty-five common Puerto Rican foodstuffs (chiefly vegetables) from local markets were analyzed for total iron by the thiocyanate amyl alcohol method of Kennedy (E. S. R., 62, p. 789) and for available iron by a slight modification of the α,α′-dipyridine method of Elvehjem, Hart, and Sherman (E. S. R., 71, p. 130). These data and values for available iron, expressed as percentage of the total iron, are reported.

A modified ceric process for the determination of serum calcium, W. R. Smith (*Analyst, 69 (1944), No. 814, pp. 14–15*).—A ceric sulfate process for titrating calcium oxalate obtained in the Clark and Collip procedure for serum determination (E. S. R., 53, p. 505) is described and compared with the permanganate titration. The visual yellow end point was found to be accurate, and the 0.1 N solution of ceric sulfate to be stable over a long period.

Estimation of added calcium carbonate (Creta Praeparata) in national flour, E. N. Greer and E. C. Dawson (*Analyst, 69 (1944), No. 814, p. 14*).—Of the three methods previously described (E. S. R., 90, p. 435) for determination of added calcium carbonate in flour, the direct method, involving estimation of the CO_2 evolved upon treatment of the sample with acid, was preferred. A number of modifications in the procedure, suggested through extensive experience with the method, are presented.

Determining moisture in dehydrated vegetables, F. A. Lee and J. C. Moyer. (N. Y. State Expt. Sta.). (*Food Indus., 15 (1943), No. 11, pp. 64–65, 77, illus. 4*).—Drying of samples, first ground to 2-mm. size in a Wiley mill, in a vacuum for 6 hr. at 70° C. was used as the standard of comparison and calibration. This procedure was arbitrary since coarse grinding and increase in drying period were shown to affect the results of the moisture determination. The Bidwell-Sterling apparatus used with toluene for ½ hr. and with benzene for 1 hr. did not give very satisfactory results. Even when sample fineness was controlled (2 mm.) and distillation was continued until a constant value was obtained, the value did not check the figure obtained with the vacuum-oven procedure. Three different types of electrically operated instruments now available for the rapid determination of moisture were used in comparisons with the standard method adopted. The Dietert moisture tester, operated by a current of hot air blown through the sample which was weighed before and after drying, could be calibrated for a time and temperature of running that would give results checking within about 0.25 percent with those obtained with the vacuum oven at 70° for 6 hr. Determinations required about 6–30 min. The instrument was useful where extremely rapid results and simultaneous determinations on many samples were not necessary. The Hart moisture meter, an electrically operated instrument that determined moisture by variations in electrical conductivity of the dry product, and the Steinlite moisture tester that determined moisture by variations in the radio-frequency impedance could also be calibrated to give results agreeing to within about 0.25 to 0.50 percent with those by the vacuum-oven method. These two methods gave results in about 1 and 2 min. per sample, respectively.

A simple, rapid, quantitative method of assaying peroxidase activity in dehydrated vegetables and fruits, E. H. Lucas and D. L. Bailey (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 313–319, illus. 2*).—An excess of a solution of *d*-isoascorbic acid in a sodium oxalate-boric acid buffer solution is added to a suitable aqueous extract of the substance to be tested, together with a small quantity of a solution of 2,6-dichlorobenzenoneindophenol and dilute hydrogen peroxide. After reaction has been allowed to take place under exactly specified time conditions, further reaction is inhibited by adding a phosphoric acid solution, and the isoascorbic acid is titrated with a further quantity of the dye solution.

Judging the maturity of raw lima beans, F. A. Lee. (N. Y. State Expt. Sta.). (*Food Indus., 15 (1943), No. 9, pp. 70–71, 132, illus. 1*).—The Tenderometer developed for grading lima beans is capable of reading up to 550 lb. of shearing force per square inch and is equipped with a smaller sample chamber than the standard model developed for peas and permitting a maximum reading of 250 lb. of shearing force per square inch. The grade estimates, made over two seasons and based on the percentage of white beans in the Henderson Bush variety and the percentage

of wrinkled beans after blanching of the Clark Allgreen variety, did not correlate very well with the Tenderometer readings and were, therefore, not considered sufficiently accurate for grading purposes. Better results were obtained by estimating the rejects from the brine separator. This method, however, required attention to the strength of the brine, with alterations in the strength as the percentage of hard or old beans increased. The following Tenderometer readings are tentatively suggested as a guide in the grading of lima beans: Grade No. 1, 240 or lower; No. 2, 241–259; No. 3, 260–279; No. 4, 280–296; and No. 5, 297 and higher.

The isolation of stigmasterol and β-sitosterol from the common bean, Phaseolus vulgaris, A. C. Ott and C. D. Ball. (Mich. State Col.). (*Jour. Amer. Chem. Soc., 66 (1944), No. 3, pp. 489–491*).—"In the present work the bean oil, 'ether extract,' has been found to represent about 2.6 percent of the bean, of which 5.0–6.0 percent was unsaponifiable matter. This unsaponifiable matter consisted of 55–60 percent crude sterols. Stigmasterol made up about one-fourth of the sterols, while β-sitosterol was found to be present to the extent of 5–7 percent of the total sterols. The separation of the stigmasterol was based on the insolubility of the tetrabromide, while the β-sitosterol was obtained from the mother liquors after debromination and fractional crystallization as acetates. No sterols corresponding to α-sitosterols appeared to be present in any appreciable amount. After irradiation, the unsaponifiable matter had a vitamin D activity of about 700 U. S. P. units per gram of unsaponifiable matter, thus indicating the presence in very small amount or amounts of irradiatable sterol or sterols."

The separation of vitamin A from xanthophylls in the presence of egg yolk sterols, T. B. Mann (*Analyst, 68 (1943), No. 809, pp. 233–238, illus. 3*).—The difficulties involved in spectroscopic examination of vitamin A in the unsaponifiable fraction of egg yolk containing xanthophylls is discussed. The method developed for effecting pigment separation involves the use of an adsorption column of bonemeal and fine sand, lightly ground together, from which the vitamin A, sterols, and carotenes are eluted with 2 percent of absolute chloroform in light petroleum (boiling point 40°–60° C.), leaving the xanthophylls which may be eluted with acetone. The main eluate and washings are evaporated to dryness and made up to volume with absolute chloroform for the usual antimony trichloride test and spectrophotometric determination. In this procedure vitamin A may be estimated without interference from the sterols or the carotene soluble in petroleum ether. Xanthophylls in the acetone eluate may be determined colorimetrically or by photometry. For separation of β-carotene from vitamin A, egg yolk sterols, and neo-β-carotene, a rapid adsorbent column of bonemeal alone is used. Elution of the column with light petroleum ether removes the β-carotene alone. Subsequent washing with acetone removes the neo-β-carotene, vitamin A, and sterols. From this mixture, evaporated to dryness and taken up in hexane, neo-β-carotene may be determined by the method of Zscheile and Beadle (E. S. R., 88, p. 434).

Nature of carotenes in alfalfa, A. R. Kemmerer and G. S. Fraps. (Tex. Expt. Sta.). (*Jour. Amer. Chem. Soc., 66 (1944), No. 2, pp. 305–306*).—Neo-β-carotene B, prepared by refluxing crystalline carotene in hexane, was separated out and purified by a chromatographic treatment; neo-β-carotene U was prepared by dissolving crystalline carotene in Skellysolve F and allowing the solution to stand 1 hr. in the presence of a crystal of iodine; carotenoid X and neo-β-carotene were prepared from alfalfa leaf meal by extraction with alcoholic KOH and Skellysolve F and chromatographic separation on $Ca(OH)_2$. Mixed chromatograms of neo-β-carotene U and carotenoid X indicated that these pigments were identical; similarly neo-β-carotene B and neo-β-carotene from alfalfa were found to be identical. These findings were confirmed by comparisons of

absorption maxima of the pigments, and by the ratios of the stereoisomers produced by treating the pigments dissolved in hexane with iodine and separating by chromatographic adsorption.

Chromatographic determination of carotene in alfalfa, L. W. Charkey and H. S. Wilgus, Jr. (Colo. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 3, pp. 184–187, illus. 3*).—"A chromatographic method is presented, with supporting experimental data, which avoids the oxidative losses of carotene generally encountered in freshly harvested plant tissues, as well as errors due to incomplete extraction and incomplete separation of carotenes from other pigments present. The method includes an enzyme inactivation and sample storage procedure, making possible the collection and preparation of large numbers of samples on fixed dates. The chromatographic technic has been modified for the purpose at hand by converting the adsorption column to an adsorption filter which avoids losses of adsorbed carotene."

Isolation of carotene from sweet potatoes, J. F. Villere, D. C. Heinzelman, J. Pominski, and H. R. R. Wakeham. (U. S. D. A.) (*Food Indus., 16 (1944), No. 1, pp. 76–78, 130–131, illus. 3*).—This report describes the procedures followed in isolating carotene (β-isomer) from sweetpotatoes by (1) the acetone extraction method; (2) the mechanical concentration method, involving suspension of the finely ground sweetpotato material in 0.1 percent aqueous solution of Duponol C, a dispersing agent, centrifuging to remove the starch and fiber, and precipitating the washings with sulfuric acid; a crystalline material containing carotene was obtained from the precipitated material by acetone extraction; and (3) by the adsorption method in which the carotene is adsorbed from a petroleum ether extract of the dried sweetpotato on activated alumina from which the carotene is eluted with methyl alcohol in petroleum ether and crystallized by evaporation of the solvent. The first method gave a crystalline product of 90 percent purity in a yield of about 39 percent of that present in the sweetpotato. By the second method the precipitate obtained contained two to four times as much carotene per kilogram as the original sweetpotatoes. The third method resulted in a product of 76 percent purity in a yield of 27 percent of that in the dried material or 13 percent of that present in the original sweetpotatoes. All three of the methods are considered to offer commercial possibilities.

The calibration of fluorimeters used for estimating vitamins, alkaloids, and other substances, F. Wokes, J. G. Organ, B. M. Still, and F. C. Jacoby (*Analyst, 69 (1944), No. 814, pp. 1–5, illus. 6*).—"Fluorescence measurements in general are complicated by various factors which diminish (quench) the fluorescence, causing too low results. Concentration quenching, due to a high concentration of fluorescent molecules, may be avoided by dilution, but this, if carried too far, will lead to dilution quenching, due either to instrumental or solvent causes. This can be reduced by redesigning the instrument (e.g., so as to minimize reflection of ultraviolet light from the sides or lid of the cell) or by careful purification of solvents (e.g., isobutanol, methanol, ethanol), but in practice some dilution quenching is unavoidable. Fluorimeter cells give varying results and should be calibrated with the solution being tested. Quenching of some substances, e.g., thiochrome or riboflavin, by ultraviolet light must be prevented by a careful technic for taking readings and by using more stable standards, such as quinine or eosin. Oxygen quenching can be avoided by stabilizing the solutions with nitrogen. The effect of pH on thiochrome fluorescence has been studied. Quenching due to the pH deviating from the optimal range of 9.5 to 10.5 should be avoided by insuring that the isobutanol extract contains a suitable concentration of sodium hydroxide (between 0.05 and 0.3 percent according to experimental conditions, including presence of buffering substances). Quenching by impurities can be diminished by wash-

ing with isobutanol and by dilution. Correction for such quenching by recovery experiments may involve difficulties with certain materials."

The microscopical properties of some of the crystalline water-soluble vitamins, G. L. KEENAN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 4, pp. 514–516*).—Crystal habit, optical data (including refractive indices determined by the oil immersion method and characteristics shown in parallel polarized light with crossed nicols), and microchemical tests, are reported for ascorbic acid, calcium pantothenate, nicotinic acid and nicotinamide, riboflavin, and thiamine hydrochloride. These results are of value in the rapid identification of these substances by microscopic examination.

B complex vitamins in sugar cane and sugar cane juice, W. R. JACKSON and T. J. MACEK (*Indus. and Engin. Chem., 36 (1944), No. 3, pp. 261–263*).—Samples of cane juices and canes collected in Louisiana and Cuba were analyzed by methods noted for sucrose, thiamine, riboflavin, pantothenic acid, niacin, and biotin. The average sugar content for the Louisiana cane samples was 11.5 percent, while the average for the Cuban canes was 12.3 percent. Maximum values for these were about 12 and 19 percent, respectively. The bottom segments of the canes were generally richer in sucrose than the top segments. On the other hand, the top segments were generally richer in vitamins than the bottom ones. The data summarized indicate that the vitamin content varied from variety to variety and even between groups of varieties similar in nature. Between these groups no uniform correlation was apparent with respect to sucrose and vitamin content. A summary of the vitamin values, expressed as milligrams of the vitamins per pound of sucrose, for whole cane and juice of the Louisiana and the Cuban samples, showed that, except for pantothenic acid where the reverse was true, the Cuban cane was richer in the B complex vitamins than the Louisiana cane. This was probably true because the Cuban samples were the more mature, the Louisiana samples having been cut before full maturity because of climatic conditions. Biotin and riboflavin appeared to occur in lesser amounts than did thiamine in sugarcane and juice, whereas niacin and pantothenic acid were found in greater amounts.

Report of 1942–43 methods of analysis subcommittee on riboflavin assay, J. S. ANDREWS (*Cereal Chem., 20 (1943), No. 5, pp. 613–625, illus. 7*).—This report, dealing with a continuation of collaborative studies (E. S. R., 90, p. 10), presents the assay results of the 18 collaborators for four samples of cereal products assayed by microbiological and fluorometric methods. The data indicate that the former method tends to give somewhat higher and more erratic results. Based on riboflavin recoveries, however, both methods appear to be capable of performing satisfactorily. Throughout the collaborative tests there was a tendency for the fortified products to give erratic results and to show the same discrepancies. On the basis of the collaborative findings, it is recommended that the individual analysts give particular attention to the assay of fortified products, noting in particular their ability to recover added riboflavin.

Report of the 1942–43 methods of analysis subcommittee on thiamine assay, O. SKOVHOLT (*Cereal Chem., 20 (1943), No. 5, pp. 607–613*).—This report summarizes the results of the collaborative study of the methods applied to 10 monthly samples of cereals and cereal products, including wheat cereal and germ and enriched bread and flour, distributed for the determination. From 29 to 47 collaborators analyzed the various samples; 38 used the thiochrome procedure and 9 the fermentation method. The tabular summary presenting the results by collaborators, expressed only as deviations from the average, indicates that the results were far from satisfactory, and it is recommended that this critical comparison of thiamine assay methods be continued in a limited number of laboratories.

Folic acid, I–IV (*Jour. Amer. Chem. Soc., 66 (1944), No. 2, pp. 267–268; 269–271, illus. 3; 271–274; 274–278, illus. 11*).

I. *Concentration from spinach,* H. K. Mitchell, E. E. Snell, and R. J. Williams.—An aqueous extract of spinach prepared on a large scale was subjected to a concentration procedure described in detail and involving at various stages adsorption on (and elution from) charcoal, alumina, and Lloyd's reagent, and precipitation with lead and silver. By the procedure followed, the folic acid from spinach was concentrated to such an extent that the product was about 137,000 times as active as a standard liver extract.

II. *Studies on adsorption,* E. H. Frieden, H. K. Mitchell, and R. J. Williams.—'Quantitative studies of charcoal adsorption of folic acid from crude preparations and from concentrates with subsequent elutions have been described. Elution of folic acid after adsorption from crude preparations is much easier than from relatively pure solutions. It has been found that this behavior is apparently due to the presence of interfering substances which affect the manner of adsorption. A working hypothesis of the mechanism of adsorption is proposed. A study of the adsorption isotherms of folic acid, riboflavin, and thiochrome upon charcoal at low concentrations is reported. There is evidence that the adsorption process is of a dual nature, since the slopes of the isotherms change markedly in the range covered. The application of these observations to concentration procedures using charcoal is pointed out."

III. *Chemical and physiological properties,* H. K. Mitchell and R. J. Williams.—This paper presents the results of physical and chemical studies of folic acid undertaken in order to evaluate methods of concentration. Esterification (to the methyl ester) caused a 90—96 percent destruction of activity, but little change in solubility or adsorption characteristics. Acetylation and methylation likewise effected little change in solubility characteristics. The solubility of free folic acid in water, glacial acetic acid, liquid ammonia, and various organic solvents was determined. Stability to various treatments—ultraviolet irradiation, contact with ozone-containing atmosphere, hydrogen sulfide, nitrous oxide, dry heat, and various chemical reagents—was measured by determining loss of original activity due to the treatment. Glycol determination and results of quantitative acetylation indicated absence of a glycol and of polyhydroxy groups. The probable presence of a xanthopterin-like structural unit is indicated. It is pointed out that a large proportion of the impurities in purified concentrates are similar in nature to folic acid. On the basis of analyses of some of these concentrates, an approximate empirical formula of $C_{15}H_{15}O_8N_5$ is given.

IV. *Absorption spectra,* H. K. Mitchell.—"Evidence has been presented to show that the absorption spectrum of folic acid resembles that of xanthopterin. The light absorbing structure in folic acid is much more stable to light and acid treatment than the physiologically active compound. Evidence is cited indicating that the difficulties in purification of many concentrates are due to the impurities consisting of inactivated folic acid with physical properties only slightly changed. An 'absorption titration' plotting molecular extinction coefficients against pH is described and its significance discussed briefly. It is concluded that folic acid contains in its structure a unit very similar to xanthopterin."

Carbon dioxide storage.—XIV, The influence of carbon dioxide, oxygen, and ethylene on the vitamin C content of ripening bananas, N. C. Thornton (*Contrib. Boyce Thompson Inst., 13 (1943), No. 4, pp. 201–220, illus. 2*).—In this study, which is one of a series (E. S. R., 81, p. 348), it was found that green bananas (*Musa sapientum* L. var. Gros Michel), as received from the steamship usually contained from 13 to 15 mg. of ascorbic acid per 100 gm. of pulp. During ripening at 19° C., there was a slight increase in the ascorbic acid content at the

time of early development of yellow color, followed by a decrease to 10—12 mg. per 100 gm. of tissue with complete yellowing; the ascorbic acid remained at about this level until approximately 50 percent of the peel was brown and the pulp had softened, when there was a further gradual decrease with browning to about 7.7 mg. as the peel blackened, and a strong fermented odor developed. Variations of oxygen concentration had no detrimental effect on the ascorbic acid content of the banana. Exposure to CO_2 resulted in a reduction in ascorbic acid in the green banana, the amount of the reduction becoming greater as the CO_2 concentration increased, but had little effect on the vitamin in the ripe banana. With continuous CO_2 treatment of the banana during the courses of ripening there was an initial reduction in ascorbic acid content, followed by a gradual increase, until at the brown peel stage it approached the content of the untreated brown peel fruit; removal from CO_2 to a normal atmosphere at any stage of treatment resulted in a rapid recovery of the ascorbic acid content to a level approximating that of the untreated fruit at the same stage of ripening. Neither ethylene in concentrations of 1—8,000 to 1—500 parts of air, nor hydrogen cyanide at various concentrations, had a detrimental effect on the ascorbic acid content of the banana.

The oxidation of ascorbic acid in the presence of copper, E. M. Mystkowski (*Biochem. Jour., 36 (1942), No. 5–6, pp. 494–500, illus. 2*).—In this study of the influence of NaCl and proteins on the oxidation of ascorbic acid by Cu, the systems contained phosphate buffers in final concentrations of $^1/_{10}$—$^1/_{15}$ M, ascorbic acid 3–4 mg., substances whose influence was to be examined, and water up to the volume of 15 or 20 cc. The systems were left in open flasks at 24° [C.] (except where the influence of temperature was studied), and at intervals samples were taken, acidified with acetic acid, and the remaining ascorbic acid determined by titration with dichlorophenolindophenol. The results presented and discussed are summarized as follows: "The oxidation of ascorbic acid by Cu is inhibited by NaCl, amino-acids, and proteins. This inhibition was found in systems with either atmospheric O_2 or H_2O_2 as oxidant. The influence of tyrosine is different from that of other amino-acids and is connected with its participation in redox processes. NaCl shows either inhibiting (oxidation of ascorbic acid) or activating (catalase activity of Cu, oxidation of tyrosine) influence on the reactions catalyzed by Cu. NaCl has no influence on the action of ascorbic acid oxidase present in cucumber juice."

Determination of ascorbic acid in preparations containing iron and ammonium citrate, J. H. Singer and M. N. Milner (*Analyst, 68 (1943), No. 810, pp. 272–273*).—The presence of about 1 percent of iron and ammonium citrate in solutions of ascorbic acid was found to interfere with the determination of the latter by direct titration, the end point being almost impossible to observe and the results being only about one-half as high as they should be. Removal of the iron by precipitation of the complex with 8-hydroxyquinoline in slightly acid solution (pH not lower than about 2.8) permitted determination of the ascorbic acid by dye titration of the filtrate. The 8-hydroxyquinoline was not oxidized by the dye and gave a perfect blank. A number of preparations containing ascorbic acid and iron and ammonium citrate and made to be comparable with commercial products were satisfactorily analyzed by the method developed. Analyses of freshly prepared and stored preparations showed that there was a slight loss of ascorbic acid immediately after preparation, and that this loss continued slowly with the result that the ascorbic acid was largely destroyed after 3 weeks.

Further studies of factors influencing the A. O. A. C. chick method of vitamin D assay, I. Motzok and D. C. Hill (*Jour. Assoc. Off. Agr. Chem., 26 (1943), No. 4, pp. 516–521*).—Earlier collaborative studies (E. S. R., 87, p. 16) having shown the need for further work to establish ways of lessening the inconsistencies

of the method, an investigation was made of the variations due to the manner of treating the bones subsequent to ash determinations. From tests on large numbers of paired tibias, ashed with and without the treatment in question, the following conclusions were drawn: "(1) Freezing of bones, as a method of storage, caused a significant decrease in the percentage of bone ash; storage in 95 percent ethanol had no appreciable effect; (2) crushing of bones previous to solvent treatment had no significant effect on the amount of lipid material extracted as reflected in the percentage of ash; (3) immersion of bones in boiling water for periods longer than one minute caused a significant decrease in the percentage of bone ash." The ashing treatment of 1 hr. at 850° C., as recommended in the A. O. A. C. method (E. S. R., 85, p. 5), appeared to be adequate for group ashing, even when the muffle was fully charged.

AGRICULTURAL METEOROLOGY

Physics of the air, W. J. Humphreys (*New York and London: McGraw-Hill Book Co., 1940, 3. ed., pp. 676+, illus. 227*).—An additional part, meteorological acoustics, not in the first edition (E. S. R., 44, p. 617), has been included in the second and third editions. The last-named "contains no radical departure from either the plan or the scope of the second. Its justification is in the elimination of a few errors and the inclusion of much additional information, especially that of recent date."

Analytical interpretation of density-currents of air chilled by nocturnal radiation, F. A. Brooks and W. P. Berggren. (Calif. Expt. Sta.). (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 189–204, illus. 3*).—"The flow of cold-air down slopes on clear, calm nights is a familiar phenomenon which is of great significance to citrus growers during radiation frost weather. The current is due to the fact that chilled air is more dense than that unchilled and therefore tends to underrun the lighter air. This phenomenon is somewhat similar to the submerged flow of salt water, or of water with solids in suspension, under clear fresh water. . . . The authors have not seen an adequate analytical method which would satisfactorily treat buoyancy stability and account for the eddy transfer of heat or moisture across fluid planes of zero shear stress. It is hoped that critical discussions of this paper will lead to that objective." There are 25 references.

A comparative study of rain-gages, H. C. Storey and E. L. Hamilton. (U. S. D. A.). (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 133–141, illus. 6*).—Rainfall measurements by the standard rain gage were found to be consistently low, but their accuracy was increased by tilting them normal to the slope. Lowering a gage to the ground level further improved its accuracy but not enough in usual practice to warrant the great amount of work required for many gages. The sunken gage proved inadequate for snow measurements, and another disadvantage was the interference by animals. The gage partially sunken in the ground, as advocated by the British Metereological Office, partially meets the last two objections but is still subject to the first disadvantage as above. The stereo rain gage gave good results but it was found no more accurate than the standard-height tilted gage; it is also more expensive to construct and its aerodynamics are inferior to the tilted gage. The trough gage gave an excellent measure of rainfall but again its construction is somewhat intricate and fairly expensive and, furthermore, it is unsuitable for snow. In mountainous situations, however, where an accurate measure of rain from a single gage is desired, the trough type is highly recommended. The 4-in. gage is not recommended where it is desired to obtain reliable and consistent measurements. The authors recommend that a new standard practice as to rain-gage exposure be considered wherein all gages for hydrographic use be exposed normally to the ground slope at the site of the instrument.

Monthly rainfall-distribution in southern California, with special reference to soil-erosion problems, M. DONNELLY. (U. S. D. A. and Univ. Calif.). (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 144–148, illus. 10*).—Experience in southern California in the excessively wet season of 1940-41 indicated that one step in reducing erosion losses on dry-farmed bean land would be to provide for growth of a winter cover crop in seasons with above-normal rainfall. This premise led to the discussion of the six types of rainfall seasons in the area according to monthly distribution and amount, the frequency distribution of total seasonal rainfall values and of seasonal values in relation to runoff and flood hazard, the relation of season type to soil erosion hazard on winter-fallowed land, and the erosion contrasts in the 1920's and 1930's. By use of the analysis given it is believed possible to predict the erosion and flood hazard in southern California with a fair degree of accuracy in some seasons.

Soil-temperature in the Matanuska Valley of Alaska: Observations of 1941, M. F. BURRILL (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 151–153, illus. 1*).—Observations on which the present data were based were made between July 3 and September 10, 1941; they include those widely scattered in time and space taken with pocket thermometers in the walls of shallow holes dug for the purpose and records obtained by a three-element soil thermograph, which was installed on July 12 at the experiment station near Matanuska.

Efficient sampling of climatic and related environmental factors, H. G. WILM. (U. S. D. A.). (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 208–212*).—In studying numerous environal factors, especially those associated with climate, the investigator is often faced with the problem of adequately sampling the desired factor on relatively large land areas—a task made difficult by the cost of the necessary instruments and of the collection and analysis of data. It is suggested that the problem may be considerably simplified by employing the procedures outlined, by which a number of places can be sampled in each area under observation with a minimum number of instruments. Although the data for any single day or sampling period contain errors due to both time and sampling position, the total or average for each time stratum and for a whole season are free from any confounding.

The microclimates of a small valley in central Ohio, J. N. WOLFE, R. T. WAREHAM, H. T. SCOFIELD, and E. N. TRANSEAU. (Ohio State Univ.). (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 154–166, illus. 6*).—This is the first report of a study on the microclimates of a small valley located in a biotically and geologically distinct region of central Ohio. It is concluded from the findings that atmospheric factors are fully as significant as the soil factors in explaining the pattern of plant communities in a diversified area; these factors certainly are most important in explaining the seasonal variations in plant behavior. Conditions of temperature surrounding living plants varied widely in different parts of the valley at all seasons of the year; these differences may be attributed in part to cold air drainage, snow cover, variations in isolation and radiation, and to physical characteristics of the substrate. Evaporation from atmometers placed in various habitats furnished data significant for recognizing and separating microclimatic areas. Light conditions were measured by portable, recording, simply designed, inexpensive light meters using bimetallic coils; these were constructed in the university laboratories. Although only a preliminary study was made with these instruments, the information appears to be useful in differentiating diurnal and seasonal light regimes. The data recorded by this light meter are comparable to those obtained from a pyrheliometer of the Eppley type. The authors' data indicate different climates in three superposed layers, viz., the leaf litter, herbaceous plant, and shrub levels; the small-tree and canopy levels were not investigated. The maximum and minimum

temperatures within the lowest 1-ft. layer of the atmosphere varied both in degree and duration in various parts of the valley. Moreover, the time of maximum temperatures varied from April to September in the several habitats. Observations made in standard U. S. Weather Bureau shelters contributed little to the evaluation of the climatic factors influencing the development, distribution, and persistence of plant and animal communities in local areas. This investigation is being continued and intensified. There are 15 references.

Ohio weather summary for 1943, J. T. McCLURE (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 208–210*).—A brief summary for the year at Wooster, with tabulated data for temperature and precipitation.

SOILS—FERTILIZERS

[Soil Survey Reports, 1934, 1937, and 1939 Series] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. [Soil Survey Rpts.], Ser. 1934, No. 25, pp. 111+, illus. 14; 1937, No. 10, pp. 104+, illus. 5; 1939, No. 2, pp. 148+, illus. 14*).—These surveys were made in cooperation with the State experiment stations as respectively noted: 1934, No. 25, Billings County, N. Dak., M. J. Edwards et al. (N. Dak. Expt. Sta.); 1937, No. 10, Tishomingo County, Miss., A. C. Orvedal et al. (Miss. Expt. Sta.); and 1939, No. 2, Vanderburgh County, Ind., A. J. Vessel et al. (Ind. Expt. Sta.).

The nature and properties of peats in New Jersey, S. A. WAKSMAN. (Rutgers Univ.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), p. 386*).—The peats of New Jersey cover about 8 percent of the total surface area. They vary greatly in depth, origin, chemical composition, and utilization. Moss peat is entirely absent, although sphagnum is growing on the surface of many peat areas in the State. The sedge and reed, or low moor peats, predominate in the northern or glaciated areas. Forest peats and salt marshes predominate in the southern or Coastal Plain areas.

The tirs of Morocco, E. H. DEL VILLAR (*Soil Sci., 57 (1944), No. 5, pp. 313–339*).—The author describes the term "tirs" as a Berber word having the meaning "soil" in one dialect, in another dialect, "humus"; and defines the word as "now applied by the natives of Morocco to soils that appear to contain much humus." Profiles of the glei tirs, broken land and deep tirs, and the crust tirs in mixed soils are described in detail, and the physiological conditions under which each is found are indicated. Modes of formation of such soils are discussed.

Interpretation and use of soil classification in the solution of soil management problems, R. W. SIMONSON and A. J. ENGLEHORN. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 419–426*).—Two groupings, one of the soil types of Iowa and one of the soils of Tama County, are presented and discussed as examples of technical groupings designed for use in extending recommendations for land use and soil management. The construction of these groupings, their application, and their limitations are considered in the light of the principles discussed.

Knowledge of soils essential for successful farming, H. B. VANDERFORD (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 6, pp. 1, 8*).—A general discussion of the soil sections of the State, with particular reference to the crop adaptations and most desirable land use. The various types of farming and the use of commercial fertilizers for particular crops under the different soil conditions are indicated.

Experiences of a county agent in using soil maps in Tennessee, J. A. EWING. (Univ. Tenn.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 427–430*).—Use of soil maps as an important part of the program for introduction of more suitable and effective use of land types in a county consisting mostly of steep, rough, and poor soils is described with illustrative instances, in some of which striking increases in yield per acre and in total productivity of the farm have been obtained.

The use of soil maps for assessment purposes in California, R. E. Storie and W. W. Weir. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 416–418, illus. 2*).—Pursuant to the purposes of the California land-assessment laws, which require that lands of like quality and similarly situated be similarly assessed, soil types and phases have been rated in accordance with the Storie index (E. S. R., 70, p. 157). This was found a useful first step, but there was also needed "along with the index rating of each soil type . . . a natural grouping of all the soils so that the assessor could understand and explain to the land owner." To meet this need a "natural land type" soil grouping was set up. On a basis of natural land features there are five of these groups: (1) Soils of recent and young alluvial fans and flood plains; (2) soils of the basins; (3) soils of low terrace; (4) soils of high terrace; and (5) soils of the uplands. These five major groups are further divided into natural land type subgroups, the soils of each having a relatively narrow range in profile development, soil texture, topographic position, and index rating.

The contribution of the soil survey to the guayule emergency rubber project, F. O. Youngs. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 412–415*).—Requirements for healthy, rapid growth of the plant include a permeable, well-drained, well-aerated soil; a reasonably good supply of soil moisture for a considerable part of the year; and fairly high soil fertility. Of these requirements, permeability and good drainage appear the most important. A large number of soil types is tabulated in four classes of graded suitability, together with a fifth small group, not suited for guayule.

Association of crops with soils and other factors, Jefferson County, Tennessee, H. J. Bonser (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 169 (1944), pp. 71+, illus. 47*).—A detailed report of crop acreages by soil types for cleared land on farms situated near the French Broad River and its larger tributaries in Jefferson County, Tenn., for the 1939 crop year. The relation of other factors to land use is also discussed.

Preparing garden soils, P. P. Pirone, L. G. Schermerhorn, F. E. Bear, and C. H. Connors (*New Jersey Stas. Cir. 477 (1944), pp. [4], illus. 3*).—A practical presentation of the nature and management of soil for the gardener. The circular includes information on the function of the soil, liming, fertilizers, manures, how to apply lime fertilizer and manure, digging the garden, when and how to dig, and raking.

Moisture conservation practices and the relationship of conserved water to crop yields, L. L. Compton. (Kans. State Col.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 368–373*).—Moisture is the primary factor limiting crop yields in the Great Plains. Timely tillage is the most effective and efficient means of storing water in the soil and thereby increasing crop yields. Special mechanical practices, such as contour farming, basin listing, and terracing, are valuable aids in conserving moisture unless through the initiation and use of these practices tillage is delayed or farming operations materially slowed up, in which case the gain is likely to be more than offset by losses resulting from late tillage. In dry seasons, increased yields from terracing have been largely due to the accumulation of moisture immediately above the terraces. With more abundant rainfall, such accumulation may prove undesirable on the heavier soils. Poor seed, inferior crop varieties, improper rate or date of planting may nullify the advantages of moisture conservation.

Rebuilding eroded soil is a slow process, R. E. Uhland (*U. S. Dept. Agr., Soil Conserv., 9 (1944), No. 12, pp. 276–279, illus. 2*).—Results of experiments on soil-productivity loss and the effect of various management practices on rebuilding are presented from the soil conservation experiment stations of Temple, Tex., and Bethany, Mo. The data from these two locations show that the organic matter of badly eroded soils was increased and the yields improved, but the rate of increase was

very slow and may be expected to be slower as the level of organic matter increases. In order to increase the organic matter appreciably in badly eroded soils, a cropping system must be used which controls erosion, and a large portion of the vegetative growth must also be returned to the soil. By adding barnyard manure, along with fertilizer and lime, the soil was improved more rapidly than without treatment. Observations showed that crop production on the exposed subsoil plats, as well as on severely eroded plats or fields, was affected more seriously by dry weather than was the normal surface soil. The findings indicate that in order to increase appreciably the organic matter in badly eroded soils it is necessary to supply needed fertilizers and maintain them in noncultivated crops most of the time.

Laboratory percolation through undisturbed soil samples in relation to pore-size distribution, R. M. Smith, D. R. Browning, and G. G. Pohlman. (U. S. D. A. and W. Va. Expt. Sta.). (*Soil Sci., 57 (1944), No. 3, pp. 197–213, illus. 8*). —Sample laboratory procedures for the determination of percolation rates of undisturbed soil samples are described, together with apparatus both for downward and for upward percolation.

The rate of percolation of normally aggregated soils was not affected appreciably by direction of percolation or by the use of muslin or blotting paper membranes. Soils having worm holes or other continuous large flow channels showed extremely high rates of percolation when only a muslin membrane was used. In such soils the presence and behavior of these flow channels could be readily observed. The use of blotting paper membranes gave, with these samples, results that are believed to be more like field percolation rates. The effective pore-size distribution was measured by determining water removal at tensions of 10, 40 and 100 cm. of water, and the relationship to percolation rates was studied. The porosity factor used by Nelson and Baver (E. S. R., 88, p. 17) gave fairly satisfactory results, but a more accurate picture of the relationship was obtained by using a porosity factor as follows: Percent pores drained at 10 cm.

$$+\frac{\text{percent pores drained between 10 and 40 cm.}}{4} + \frac{\text{percent pores drained between 40 and 100 cm.}}{\text{percent pores drained between 40 and 100 cm.}}.$$

Pores drained at tensions from 40 to 100 cm. made only very small absolute contributions to percolation and their effect could be omitted from the factor except for soils having very slow rates. These results indicated that the water-filled pores contribute to percolation approximately in proportion to their diameters rather than to the square of their diameters as required by the law of viscous flow. Reasons for this appear to be associated with the trapping of soil air. Neither percolation rate nor pore-size distribution measurement alone was found sufficient to characterize water movement in soils. The two determinations should be used to supplement each other in affording a picture of the momentary physical condition of a particular soil with respect to water movement.

Permeability-capillary potential curves for three prairie soils, H. R. Christensen. (Iowa Expt. Sta.). (*Soil Sci., 57 (1944), No. 5, pp. 381–390, illus. 5*).— The author describes an autoirrigator apparatus for measuring unsaturated permeability of soils with disturbed structure and some other apparatus and methodology employed in securing the necessary physical data, and discusses mathematically the solution of the general flow equation. Results graphically shown include curves of log ($K \cdot 10^{11}$) [K=soil permeability] as a function of the capillary potential for drying and wetting of soil with disturbed structure obtained by the autoirrigator method (Marshall and Shelby silt loams and Dickinson fine sand); log ($K \cdot 10^{11}$) as a function of the capillary potential for drying and wetting of

soil with natural field structure obtained by the cylinder method (Marshall and Shelby soils); log ($K \cdot 10^{11}$) for desorption obtained by the column method (Marshall silt loam and Dickinson fine sand); and log ($K \cdot 10^{11}$) as a function of the time in days for the flow of moisture in saturated soil (Marshall field structure, Marshall disturbed structure, and Shelby disturbed structure).

Comparison of base-exchange equations founded on the law of mass action, O. C. Magistad, M. Fireman, and B. Mabry. (U. S. D. A.). (*Soil Sci., 57 (1944), No. 5, pp. 371–379*).—Fallbrook sandy loam saturated with calcium was treated with mixtures of sodium chloride and calcium chloride in which the sodium concentration and volume and the quantity of soil were each varied in turn. The equilibrium data were then examined to test the closeness of fit with the base-exchange equations of various investigators. The equation of Gapon gave the best fit. This was also found true when analytical data reported by Gapon were examined. The shift in equilibrium with dilution is satisfactorily explained by each of three equations, but not by the absorption type equations. At increased temperatures, slightly smaller quantities of sodium were present in the soil at equilibrium.

Base saturation and pH in relation to liming and nutrient conservation of soil, A. Mehlich. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 353–361, illus. 2*).—The quantities of magnesium and potassium lost from the surface of sandy soils in the field decreased with increasing base saturation. These nutrients were not retained by the acid subsoils, irrespective of the base exchange capacity. Increasing the percentage base saturation of the subsoil increased the retention of potassium and magnesium. In percolators, increasing the base saturation of subsoils by liming increased the retentive power for potassium and magnesium, favored root penetration, increased moisture utilization, and increased plant growth. By increasing the base saturation of the subsoil, the losses of ammonia and nitrate nitrogen were at first increased; however, they were lost in greater amounts from the more acid subsoils after the roots had been thoroughly distributed. It is concluded that liming the surface is an inefficient method for correcting the acidity of the subsoil, hence inefficient in the conservation of plant nutrients.

Reliability of lime requirement calculations based on the rapid copper method for exchange capacity, R. E. Lucas. (Va. Truck Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 362–367, illus. 1*)—The Sieling rapid copper acetate method for the determination of exchange capacity (E. S. R., 87, p. 173) was used in a study of lime requirement for 46 Coastal Plain soils. There was a positive correlation ($r=0.98$) between the exchange capacity by the rapid copper acetate method and the lime requirement. The quantity of 200-mesh dolomitic limestone necessary to raise the pH from 5.2 to 6.2 in two million pounds of soil was calculated to be about 630 ± 80 lb. for each milliequivalent of exchange capacity per 100 gm. of soil; a value determined from the liming curves from soils with exchange capacities that varied from 1 to 22 m. e. With the aid of a photoelectric colorimeter, the measurement of the copper concentration was as satisfactory in the copper acetate solution as in the cuprammonium complex for determining exchange capacity for lime requirement recommendations.

Soil reaction influences most of Long Island's crops, P. H. Wessels. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, pp. 11–12*).—Data are given on the soil reaction best suited to the production of various vegetable crops under Long Island soil conditions. The relation of soil reaction to the yield of vegetable crops is given for potatoes, cauliflower, tomatoes, lima beans, snap beans, peas, beets, carrots, spinach, lettuce, and onions.

Effect of media composition on the numbers of bacterial and fungal colonies developing in Petri plates, L. E. Tyner (*Soil Sci., 57 (1944), No. 4, pp. 271–274*). —The addition of boric acid either to potato dextrose agar or to the synthetic media used effectively suppressed the growth of bacteria but permitted a satisfactory count of fungi. Since boric acid suppresses bacterial growth by means other than an increase of the H-ion concentration, this acid may be added to the medium before it is sterilized, instead of when the plates are poured. A higher count of fungi was obtained in the presence of boric acid than of sulfuric acid.

The activity of microorganisms in the transformation of plant materials in soil under various conditions, H. L. Bodily. (Md. Expt. Sta.). (*Soil Sci., 57 (1944), No. 5, pp. 341–349, illus. 4*).—In soil samples treated with various inorganic fertilizers and with dry, finely ground red clover or corn stover, the numbers of bacteria rose to a maximum by the end of 3 days. Thereafter, the numbers dropped rapidly to the sixth day and declined gradually during the remainder of the experiment. After 54 days the numbers of fungi and actinomyces began to increase and reached a maximum at the eighty-fourth day. The numbers of bacteria were affected most by the nature of the plant material and by the application of lime. The addition of lime produced slightly greater increases in the red clover series than in the corn stover series. The type of plant material, however, had little influence on the numbers of fungi and actinomyces. Ammonium nitrate produced the most favorable influence on fungi, but its influence was completely offset by the addition of lime. Lime produced an increase in the numbers of actinomyces, but only a temporary change in pH values of the soil. Its addition appears to have had a retarding influence on fungal development as a result of increased bacterial activity rather than of differences in the pH level of the soil. The evolution of carbon dioxide was found closely correlated with fluctuations in numbers of bacteria.

Microbial activity and aggregation of mixtures of bentonite and sand, J. R. McHenry and M. B. Russell. (Iowa Expt. Sta. and U. S. D. A.). (*Soil Sci., 57 (1944), No. 5, pp. 351–357, illus. 2*).—It was found that during 3,000 hr. of incubation of mixtures of bentonite clay, sand, and finely ground alfalfa and corn stover, untreated and hot-water-extracted, two peaks of water stability of aggregates occurred, both as a result of an accumulation of decomposition products and metabolic wastes due to microbial action. In the presence of much readily decomposable organic material an initial peak of aggregation appeared, under laboratory conditions, in 6 days. This peak is attributed to the decomposition products and microbial wastes from the rapid decomposition of the easily decomposed plant tissues. The aggregates thus formed disintegrated in a short time. A second rise in aggregation, the only one shown by the samples containing little of the easily decomposable material, occurred after 34 days, and is attributed to the accumulation of decomposition products and microbial wastes from the slower decomposition of the less readily decomposed organic materials. These aggregates disintegrated, in turn, although more slowly than did those formed in the first maximum. The two aggregation maxima were not additive. The factors producing the one apparently did not influence the other.

Methods of straw disposal as related to crop yields on the dry land experiment stations, R. I. Throckmorton. (Kans. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 374–377*).—Partial incorporation of the residues has had only a slight effect on crop yields when compared to plowing the residues under. Leaving a part or all of the straw on the surface, as by use of the duckfoot or chisel, did not give consistent results and had relatively little influence on crop yields. Most of the differences secured were not significant. "The principles underlying stubble mulch tillage appear to be sound, but the final proof of the value of the method

in the light rainfall regions will be its acceptance by farmers. However, most farmers will measure the value of the system by its influence on crop yields. Value may not be reflected immediately in increased yields and, therefore, may be overlooked by the farmer. Immediate benefits accruing from stubble mulch tillage may be reflected in the influences on the condition of the surface soil by checking the rate of flow of water across the field and by reducing erosion by wind and water."

Changes in the content of certain B-vitamins in organic materials decomposing under aerobic and anaerobic conditions, R. S. STARKEY. (N. J. Expt. Stas.). (*Soil Sci., 57 (1944), No. 4, pp. 247–270, illus. 3*).—The nicotinic acid content of the plant residues examined varied from 2.4γ to 85γ per gram (on the dry basis); most residues contained less than 30γ. The nicotinic acid content was greater than that of pantothenic acid or riboflavin. The vitamin content was low in residues containing much structural tissue. Changes in the concentrations of riboflavin, pantothenic acid, and nicotinic acid in composts of wheat straw, grass, and a straw-grass mixture showed an increase generally during the first week or two of composting, accompanying the rapid initial microbial development. As decomposition of the organic matter progressed, the vitamin content markedly decreased. Materials initially of high vitamin content lost a large part of the vitamins, and the well-composted materials had lower vitamin content than the plant substances from which the composts were prepared. The percentage losses were lower with plant materials that initially contained little vitamins. The composting materials tended to become alike in vitamin content, irrespective of their initial vitamin contents. Decomposition of the total organic matter was slower under anaerobic than under aerobic conditions, and there were smaller increases in vitamin content during early stages of decomposition and somewhat greater percentage losses after prolonged composting. The general order of the changes was similar, however, under both aerobic and anaerobic conditions. In some instances, the vitamin content increased 200–300 percent during the first week or two of composting.

Feed efficiency in terms of biological assays of soil treatments, G. E. SMITH and W. A. ALBRECHT. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 322–330, illus. 5*).—Of lespedeza forage grown on an unspecified soil of low phosphate and calcium content, 12.7 lb. were required to produce 1 lb. of gain in feeder lambs. Of the same forage grown on phosphate-treated soil, 9.7 lb. were required to give 1 lb. of gain, and when grown on lime- and phosphate-treated land the requirement was 7.6 lb. per pound of gain. Corresponding figures for soybean hay were, respectively, 9.7, 5.4, and 4.4 lb. of the forage per pound of gain. When fed these forages from untreated, phosphated, and limed and phosphated land, the lambs consumed with the lespedeza 4.3, 3.5, and 2.5 lb., respectively, of grain supplement, the corresponding respective figures for the soybean feed being 4.2, 2.3, and 1.7 lb. of grain supplement per pound of gain in weight. Improvement in some characteristics of the wool was also found to result from the feeding of hays grown on land given both phosphate and lime treatment. Lambs fed lespedeza grown on soil given the phosphate treatment only produced wool which broke down on carding after alkalized scouring (loss in scouring 34 percent), whereas with the lespedeza grown with both lime and phosphate wool was produced which remained fluffy after scouring (scouring loss 24 percent).

Ammonium sulfate without other fertilizer elements increased the crop yield but lowered the feeding value of the forage for rabbits. A complete fertilizer increased both crop yield and feed efficiency.

Influence of cropping, rainfall, and water table on nitrates in Everglades peat, J. R. NELLER. (Fla. Expt. Sta.). (*Soil Sci., 57 (1944), No. 4, pp. 275–280*).—The accumulations of nitrate nitrogen in various cropped and uncropped areas

of Everglades peat were recorded from October 1934 to June 1936. The soil water levels in these fields are kept fairly constant by pumps. The fertilizers used contained no nitrogen.

Conversion of the nitrogenous material of the peat was rapid, and there was no indication that the pasture grass, corn, and sugarcane would have responded to a nitrogenous fertilizer except for brief periods following a succession of heavy rains. Nitrate accumulation was low under a crop of celery irrespective of whether the land had been in clean fallow or a cover crop had been turned under. Nitrate contents were not significantly higher under corn where a cover crop had been used. Rainfall carried nitrates downward, and at the end of the rainy season the accumulations of nitrates were much reduced. During the dry season nitrates were ample for crops of moderate nitrogen requirements even where the water table was held as high as 12 in. below the surface of the peat.

Ammonium nitrate hazards in handling as a fertilizer, R. O. E. Davis. (U. S. D. A.). (*Chem. and Metall. Engin., 51 (1944), No. 4, p. 101*).—Although ammonium nitrate can be used as a high explosive, it requires a high-velocity detonator in sufficient quantity to energize the mass. Under favorable conditions of pressure, rapid heating, and retention of heat, ammonium nitrate may be exploded partially from heat alone at 207° to 350° C., or completely above 350°; but no instance of explosion in ordinary containers or in bulk, when involved in large conflagrations of buildings or cargo vessels, has been recorded. Explosion of the salt by impact or friction is difficult and requires favorable conditions obtained by design. Sensitivity is decreased by presence of alkalies and alkaline earths and increased by presence of acid, such as nitric formed in decomposition of ammonium nitrate at moderately low temperature.

The fire hazard is much the same as that produced by sodium nitrate, and similar precautions against fire are recommended. Ammonium nitrate should not be stored in bulk unless in a form definitely known not to cake in the time it will be stored. Bulk storage is often likely to result in severe caking, making it difficult to handle without blasting. Caked ammonium nitrate should never be broken up by blasting with explosives. Caked material may be broken up mechanically, however, without apparent danger of detonation.

Calcium nutrition at respective pH levels, F. Moser. (S. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 339–344*).—The calcium supplied at low pH values appeared to be a growth factor more important than pH. Maximum yields for soybeans were produced at a pH range of 3.8–4.2 when the nutrient solution contained 10 milliequivalents of calcium. Lespedeza produced maximum yields at the pH 5.2 level and sorghum at pH 4.2. The soybeans and lespedeza required more calcium for growth than sorghum. The former crops utilized 5.0 and 10.0 m. e., while with the latter crop 2.5 m. e. was sufficient. The calcium concentration in the crops reached a maximum when 10 m. e. were applied at the pH 6.0–6.5 level.

The magnesium content of crops increased proportionately to the calcium supplied in the nutrient solution and appears to be directly correlated with the calcium content. Phosphorus concentration in plants gradually increased with calcium supply and maximum mobilization occurred at the lower pH values. Soybeans, lespedeza, and sorghum had maximum potassium contents at the higher calcium increments at each pH level, attaining the highest concentration for 10 m. e. treatment at pH 6.0–6.5.

Effect of applications of sodium on the composition and yield of cotton at different levels of potash fertilization, H. P. Cooper and W. H. Garman. (S. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 331–338, illus. 7*).—The authors report experiments indicating that at all levels of K_2O fertilization the

plats receiving Na produced considerably more seed cotton per acre than those not receiving Na. The percentage increase in yields of the Na plats over the corresponding no-Na plats decreased with increasing K fertilization. The initial 15 lb. of K_2O produced the greatest individual increase, averaging 422 and 436 lb. per acre, respectively, on the plats with and without added Na. The results are said to suggest that with heavy applications of K little or no increase in yields would be secured from additions of Na. An application of 30 lb. or more of K_2O per acre maintains or increases the yields of cotton on the soils used. On the plats receiving no K and those receiving 15 lb. of K_2O there were decided decreases in yields. On the plats receiving KCl and NaCl, singly or in combination, Na increased the yields of seed cotton, particularly at the lower potassium application levels. Where no K was used the addition of 40 lb. of Na_2O produced a 20-percent increase in yields. Where no K was used and the crop was side dressed with $NaNO_3$ there was a 40-percent increase in yields. The average Na content was from 471 to 883 percent higher in the cotton plants grown on the plats receiving Na as the nitrate than in those grown without Na. Increasing the rate of K fertilization did not appreciably affect the net absorption of Na. The average milliequivalent ratio of Ca : K+Na was greater in the plants grown without added Na.

The effect of minor elements on the growth of certain crops, H. C. HARRIS. (Del. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 345–352*).—Experiments on Portsmouth and Sassafras sandy loams, on Chester loam, and on Norfolk sand were carried out with additions of lime sufficient to bring the pH value to 6.3.

Neither magnesium nor copper, boron, nor manganese had a significant average effect in these experiments. However, copper on Portsmouth sandy loam was beneficial to soybeans at practically the 5 percent level, and boron for peas on the same soil was beneficial but at a smaller percentage. Boron was detrimental to lima beans at practically the 5 percent level. The average effect of zinc was significantly detrimental in two cases. Reddish brown spots on the lower leaves of soybeans, peas, and lima beans appeared whenever boron was applied. These spots occurred even in the experiment in which there was some suggestion that boron might be beneficial to yields.

"There were several significant two-factor interactions, the more interesting of which were boron and manganese, boron and zinc, fertilizer and copper, and fertilizer and boron. In these cases an element did not behave in the same way individually as when it was paired with the other element. For example, boron on alfalfa appeared to be beneficial without fertilizer but slightly decreased the yield with fertilizer. There were several significant three-factor interactions. In these cases the interaction of two factors was influenced by the third factor. For example, in the case of alfalfa, the response to fertilizer appeared to be greatly increased by the addition of zinc, but this increase in response to fertilizer seemed to be eliminated by adding copper."

The results suggest that the associated elements may have had much influence upon the response of the element studied.

The manganous-manganic equilibrium of soils, G. D. SHERMAN and P. M. HARMER. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 398–405*).—It was found that neutral and alkaline conditions favor the formation of manganic manganese and acid conditions that of manganous manganese. Strong reducing agents are capable of reversing the oxidative equilibrium. Winter conditions favor the formation of the manganous ion and summer conditions the manganic ion. In general, as the manganous ion decreases in the soil, the easily reducible maganese dioxide increases and, as the manganous ion increases, the easily reducible man-

ganese dioxide decreases. In any alkaline soil at least 3 p. p. m. of exchangeable manganese must be present for satisfactory crop production. In order to maintain an adequate level of the exchangeable fraction, this must be supplemented by at least 100 p. p. m. of easily reducible manganese. In acid soils, the optimum level of exchangeable can be much lower, the quantity depending on the degree of acidity. In a comparative study of the proportions of the three available manganese fractions present in different soils, care should be taken to secure all samples at the same time of year and to maintain them at field moisture and field temperature until the determinations are made.

Progress report on the control of zinc toxicity in peat soils, E. V. Staker. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 387–392*).—An investigation of some of the possibilities of alleviating the toxic effects of zinc in the peat soils of western New York is reported. Four soils varying in zinc content from 0.43 to 10.16 percent zinc were subjected to various greenhouse, laboratory, and field experiments. In an experiment on a peat soil of the relatively low zinc content of 0.43 percent, the treatments included manure, urea, diammonium phosphate, calcium cyanamid, calcium silicate, calcium carbonate, and sodium hydroxide. Of these materials, sodium hydroxide sufficient to raise the pH value of the soil to 7.0 gave the best growth of spinach, although the yield was less than half that obtained on a normally productive soil under similar conditions. In another experiment, calcium hydroxide was compared directly with sodium hydroxide and calcium carbonate, and at the rate of 4 tons per acre gave the highest yields of both spinach and onions, closely approaching the yields obtained on the productive soil. Under field conditions, with potatoes as the test crop, a significant response to hydrated lime was obtained when it was added at the rate of 4.9 tons per acre.

Neither calcium hydroxide nor sodium metaphosphate increased the productivity of peat soils containing large percentages of zinc. Leaching with acid, followed by liming to the original pH value, also failed to improve the productivity of these soils.

AGRICULTURAL BOTANY

Edible and poisonous plants of the Caribbean region, B. E. Dahlgren and P. C. Standley (*Washington: Navy Dept., Bur. Med. and Surg., 1944, pp. 102+, illus. 72*).—"This manual is designed to aid the serviceman to live off the land if he becomes separated from his unit. It illustrates and describes common edible and poisonous plants of the Caribbean region, chiefly of Central America and the West Indies."

Methods of reporting plant distribution data, F. E. Wynne (*Chron. Bot., 7 (1943), No. 8, pp. 426–428*).—A recent survey of botanical literature for a floristic study of the northeastern United States revealed "a lamentable casualness in publishing additions to the botanical knowledge of that area." The difficulties encountered in trying to sort out the new from the republished information prompted the suggestions made in this brief paper.

Composition of fruits and phloem exudate of cucurbits, A. S. Crafts and O. A. Lorenz. (Univ. Calif.). (*Plant Physiol., 19 (1944), No. 2, pp. 326–337*).—The N content of phloem exudate of Connecticut Field pumpkin and Early Prolific Straightneck summer squash was much higher than that of their fruits; the C contents were essentially the same. Thus the C : N ratio of the exudate is consistently lower than that of the fruits. Furthermore, this ratio does not change significantly between the first and second drops of exudate or between successive exudate samples collected by repeatedly cutting the same stems. It is concluded that phloem exudate

from cucurbits can no longer be considered a true sample of the assimilate stream. There are 28 references.

Size-frequency studies of Pinus palustris pollen, S. A. and L. G. CAIN. (Univ. Tenn.). (*Ecology, 25 (1944), No. 2, pp. 229–232, illus. 1*).—Two different preparations of pollen of the same collection were found not to differ significantly, 150 grains being found to constitute an adequate sample for size-frequency studies; collections from different localities may be similar in size characteristics or rather dissimilar. In instances where species differ but little in size characteristics it is unlikely that the size-frequency method alone will allow their identification. When only a few species are involved in an identification problem, however, and when their sizes differ sufficiently not to be obscured by the normal variability within the species, this technic may provide a satisfactory basis for determining species.

Growth responses of hemp to differential soil and air temperatures, C H. NELSON (*Plant Physiol., 19 (1944), No. 2, pp. 294–309, illus. 3*).—The development of *Cannabis sativa* grown in pure quartz gravel cultures in the greenhouse was traced from germination to maturity with (1) shoot and root at 30° C. (series H/H), (2) shoot at 30° and root 15° (H/L), (3) shoot at 15° and root at 30° (L/H), and (4) shoot and root both at 15° (L/L). A marked decrease in water consumption at or immediately after anthesis followed by a subsequent rise was noted in both ♂ and ♀ plants of all series. Marked sex reversal from ♀ to ♂ was observed in series L/H and L/L subjected to transition from long to short day at anthesis. Other significant responses were as follows: In H/H—maximum stem elongation, largest number of nodes, earliest blooming and seed formation, predominance of ♂ flowers, lowest aggregate leaf area of the four series, greatest number of leaf abscissions, and highest absolute water consumption for growth cycle. In H/L—lowest aggregate fresh, dry, and ash weights, more ♂ than ♀ flowers, and highest percentage dry weight in basal stem. In L/H—largest stem diameter, largest individual leaves, and highest aggregate fresh and absolute dry weight. In L/L—greatest total leaf area, smallest water consumption per unit leaf area, highest percentage of water content in the roots, latest blooming of the four series, and preponderance of ♀ flowers. Though the high soil and air temperatures favored maximum elongation and uniformity of stem thickness, the above findings indicate that the aggregate dry weight yield of hemp was approximately doubled by a combination of cool air and warm substrate. They also show the great importance of edaphic as opposed to air temperature in the structural and nutritional ontogeny of hemp. There are 23 references.

Vernalization of rice by short days, S. M. SIRCAR (*Nature [London], 153 (1944), No. 3882, p. 378, illus. 1*).—According to the tests here reported upon, vernalization of rice by chilling at 3°–6° C. produced no significant earliness, whereas treatment of young seedlings by exposures to short days accelerated ear emergence and increased both growth rate and grain yield. Obviously, application of the method to field practice would be possible only by treatment in the seedbed for later transplantation.

Cell shape and cell volume relations in the pith of Eupatorium perfoliatum L., J. W. MARVIN. (Vt. Expt. Sta.). (*Amer. Jour. Bot., 31 (1944), No. 4, pp. 208–218, illus. 4*).—Three-dimensional models of 50 large and 50 small cells from the pith were constructed and their volumes determined. Cells of the second group averaged 10.82 faces and were slightly over one-third the size of the 50 large cells with an average of 16.26 faces. In a population of large and small cells, the number of faces is apparently correlated with the cell size. The number of patterns formed with 4-, 5-, and 6-edged faces is limited by geometrical necessities, and many of the relatively few geometrically possible patterns were located.

Electrical correlates of form in cucurbit fruits, H. S. Burr and E. W. Sinnott. (*Amer. Jour. Bot., 31 (1944), No. 5, pp. 249–253, illus. 7*).—Potential differences were measured along the axial and equatorial diameters of young ovaries and developing fruits of three races of pumpkin differing markedly in shape and designated as "Elongate," "Round," and "Flat." The size of the potential differences bore little relation to the absolute size of the dimensions along which they occurred, but the ratio of the potential differences was closely correlated with the ratio of the dimensions. As the fruits grew larger the potential gradients (millivolts per millimeter) tended in all races to decrease, but the ratios between the gradients in the two dimensions tended to increase in the Elongate race, to decrease in the Flat race, and to be unchanged in the Round race. The morphogenic implication of these facts is discussed; in endeavoring to explain them "it is tempting to suggest that the pattern of potential differences here described may have some causal relation to the morphological pattern which appears as the fruit develops. . . . The present paper offers for the consideration of students of plant morphogenesis a series of new facts from a field which, if well cultivated, may become very fruitful."

A model of the potassium effect, W. J. V. Osterhout (*Jour. Gen. Physiol., 27 (1943), No. 2, pp. 91–100*).—The "potassium effect" refers to the ability of certain cells to distinguish electrically between K+ and Na+; this is illustrated in experiments with *Nitella*. This ability to distinguish between K+ and Na+ disappears with the removal of an organic substance from the cell, the amount of which is doubtless too small to make possible an analysis; an attempt has therefore been made to find an organic compound which can produce similar effects.

"It is found that when M/1 KCl in contact with nitrobenzene (previously shaken with M/1 KCl) is replaced by M/1 NaCl the potential changes in a positive direction to the extent of 67 mv., which compares favorably with the values found in *Nitella*. This is not due to a greater mobility in nitrobenzene of K+ as compared with Na+; this is evident from measurements of concentration effects with nitrobenzene (M/1 KCl *v.* M/10 KCl and M/1 NaCl v. M/10 NaCl). It might be brought about if KCl produced in nitrobenzene a sufficient preponderance of ions (simple or complex) as compared with NaCl. Whether this occurs could not be determined, but it was found that nitrobenzene shaken with M/1 KCl has a higher conductivity when shaken with M/1 NaCl. Measurements with salicylates showed that K-salicylate has a partition coefficient about 11.7 times as great as that of Na-salicylate. It was also found that when M/1 K-salicylate in contact with nitrobenzene (previously shaken with M/1 K-salicylate) is replaced by M/1 Na-salicylate there is a change of potential in a positive direction amounting to 56 mv. To what extent phase boundary potentials may enter into the observed values cannot be determined at present. The model resembles the *Nitella* cell in that RbCl and KCl are negative to NH_4Cl which in turn is negative to NaCl and still more so to LiCl (in the model CsCl is negative to KCl but in *Nitella* it is positive). It likewise resembles *Nitella* in that the potassium effect is lessened by the addition of guaiacol."

The growth of ovules of Pisum in relation to zinc, H. S. Reed. (Univ. Calif.). (*Amer. Jour. Bot., 31 (1944), No. 4, pp. 193–199, illus. 9*).—In controlled experiments where varying amounts of Zn were supplied in nutrient solution, the number of seeds produced on plants receiving 0.1 or 0.2 p. p. m. was equal to that on plants with 0.5 p. p. m., but the proportion of well-filled seeds was smaller. At lower concentrations the pods were smaller and the seeds generally imperfectly developed, suggesting deficiency of some necessary growth material. The ovules in plants receiving 0.5 p. p. m. of Zn developed normally and produced typical embryos, but in lower concentrations they were conspicuously atypical. Normal pollen grains were found in the anthers of plants receiving as little as 0.02 p. p. m.

of Zn; it is thus concluded that the failure to produce good seeds was due to irregularities in the growth of the ovule and its generative structures. Necrosis of cells in the funiculus and adjacent portions of such ovules was frequently observed surrounded by areas in which the cells were generally hypoplastic, vacuolate, and often showing evidence of cytolysis which destroyed their protoplasmic integrity. Coacervated globules of phenolic material gave further evidence of disturbances in the redox mechanism of the cell in which Zn normally plays an important role. Similar disruptive features were noted in the cells of embryo sacs and young embryos. Conditions such as these would explain the lack of seed production in *P. sativum* observed under Zn deficiency when the supply of other elements was adequate for both vegetative and reproductive processes.

Sobre la actividad proteolítica del látex de la candelilla Euphorbia cerifera Alc. [Proteolytic activity of the latex of E. cerifera], M. Castañeda, M. R. Balcazar, and F. F. Gavarron (*An. Escuela Nac. Cien. Biol. [Mexico], 3 (1943), No. 1–2, pp. 65–72, illus. 4; Eng. abs., p. 71*).—The name "euphorbain" is proposed for the enzyme complex found. Like asclepain and trypsin, it has its optimum pH in the region where protein acts as an anion; on the other hand, papain reacts best at the isoelectric point of protein.

Chemical and physiological properties of maize auxin precursor, J. Berger and G. S. Avery, Jr. (*Amer. Jour. Bot., 31 (1944), No. 4, pp. 203–208*).—A chemically unidentified auxin precursor from corn was characterized by the mild alkaline treatment required to produce 3-indoleacetic acid as one of its conversion products. It was very resistant to conversion to indoleacetic acid by a variety of proteolytic enzymes. The highest conversion by enzymes was obtained with crystalline chymotrypsin, but even this gave less than 3 percent of the yield from alkaline treatment. The isolated precursor was relatively insoluble in water, ether, acetone, and absolute ethanol, but was soluble in aqueous acetone, aqueous ethanol, dioxan, and aqueous alkali. It was easily adsorbed on charcoal but eluted with difficulty. Infrared adsorption spectra, nondialyzability, and other properties of the purified precursor suggested that it is, or is adsorbed on, a protein. Opposed to this idea of a protein complex was the low N content of 4.7 percent. Results of treatment with HNO_2, I, and H_2O_2 suggested that free amino groups are not the prime requisite for the convertibility of precursor to auxin, but these reagents reduced the yield obtainable by 40–70 percent, possibly by some alteration of an amino acid in a peptide linkage. Purified zein, whole corn gluten, pure tryptophan, abrine, and three tryptophan-containing proteins yielded only extremely small amounts of auxin as compared with the isolated precursor, indicating that none of these can be identified with the precursor studied. This precursor, as such, was inactive in the oats coleoptile curvature test, the tomato petiole epinasty test, and the bean callus test, showing that these test objects are unable to convert it to auxin in any appreciable amount.

p-Aminobenzoic acid and its effect on the sulphanilamide inhibition of the growth of oat roots, R. Forbes Jones (*Nature [London], 153 (1944), No. 3882, p. 379*).—From results reported by Brian (E. S. R., 91, p. 24), it appeared that the antisulfanilamide activity of *p*-aminobenzoic acid could be absolute, indicating that the latter was an essential metabolite for wheat seedlings. From experiments here reported upon, "it would appear that p-aminobenzoic acid is not, in the fullest sense of the term, an 'essential' metabolite for the growth of oat roots (var. Victory) when these are grown for 48 hr. in the dark at 25° C. It does, however, play some part in the physiology of the seedling growth and is, no doubt, present in the seed. It may well be that some other analog of sulfanilamide could be shown to be such an 'essential' metabolite, a point of interest to workers on the growth of isolated roots of monocotyledons."

Osmotic quantities in growing cotton bolls, T. Kerr and D. B. Anderson. (N. C. Expt. Sta. and U. S. D. A.). (*Plant Physiol., 19 (1944), No. 2, pp. 338–349, illus. 2*).—Variations in the osmotic pressures of sap expressed from immature cottonseeds and the variations in diffusion pressure deficit values (D. P. D.) of living seeds of the same ages were measured for a 24-day period during the growth of the seeds. In seeds younger than 24 days the osmotic pressures exceeded the D. P. D.; in older seeds the reverse was true, the divergence increasing rapidly with age. Neither the D. P. D. nor the amount of water absorbed by the seeds was reduced by treatments inhibiting respiration. It is suggested that the lack of equilibrium between osmotic pressures and D. P. D. is more apparent than real and that imbibition is largely responsible for the absorption of water by cottonseeds.

The nutrition of the pea, R. M. Woodman (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 19–22*).—Sand-culture experiments with the pea plant indicated that 8.24–32.96 p. p. m. available N is the optimum range for yield, with a bias in favor of the lower half of the range; adequate supplies of N appeared to cause branching of the tops into two or more main stems. The best range for P was 2.73–10.92 p. p. m.; that for K, 5.61–44.88 p. p. m. Marginal scorch followed by general scorch and death of the foliage progressively up the stem resulted from K deficiency. Absence of added B had no great effect, probably because an appreciable amount is contained in the seed.

Factors affecting the growth of Datura embryos in vitro, J. van Overbeck, R. Siu, and A. J. Haagen-Smit (*Amer. Jour. Bot., 31 (1944), No. 4, pp. 219–224, illus. 8*).—*D. stramonium* embryos 0.2–0.5 mm. long, isolated at the "heart-shaped" stage, were cultured aseptically in vitro in a 0.7 percent agar medium containing nutrient salts, a mixture of nutrilites, dextrose, or sucrose, 0.01 M phosphate buffer (in many tests), and embryo factor. The last is said to be essential for growth of *Datura* and occurs in coconut milk. Under these conditions, embryos gave optimum growth at 32° C. During the first 2–4 days of culturing, the optimum pH of the medium was about 7, but for further culturing pH^5 was optimum. Sucrose appeared to be a much better carbohydrate source than dextrose, 2 percent proving optimum. Extracts of *Datura* ovules, yeast extract, wheat germ, and almond meal exhibited embryo factor activity. Loss of activity from heating, chemical treatments, standing, etc., may be due to a release of toxic substances inhibitory to the growth of the embryos; this toxicity could be removed by shaking with alcohols, ether, or by lead acetate precipitation. A purified embryo factor preparation was made which, on the dry-weight basis, had an activity 170 times that of coconut milk; when added to the basic medium containing 2 percent sucrose, it promoted growth of *Datura* embryos at a dilution of 1 : 19,000.

Absorption of carbon dioxide by maize, J. Verduin and W. E. Loomis. (Iowa Expt. Sta.). (*Plant Physiol., 19 (1944), No. 2, pp. 278–293, illus. 6*).—The gas-stream method of measuring photosynthesis by CO_2 absorption eliminates translocation errors and permits employment of the same leaf segment for successive tests, but the difficulties in its use plus the natural variation gave average differences of 20–30 percent between duplicate determinations and thus obscured small experimental differences. With large numbers of determinations, however, it was not difficult to show that the light saturation value for fully exposed corn leaves was around 2,500 footcandles—or 25 percent of full sunlight. This light intensity may be obtained on the ground under well-grown corn, suggesting that midday light with full sun is entirely adequate for all its leaves. Air temperatures of 18°–34° C. were not significantly correlated with rate of CO_2 absorption. There was a suggestion in the data that air temperatures of 25°–30° gave the highest rate, with decreases at both higher and lower temperatures, the differences being

largely masked by variability in the data. When visibly wilted and unwilted leaves were compared, the former always gave the lower CO_2 absorption values. A range of 0–87 percent of the controls was obtained in wilted leaves, with an average for 21 tests of 37 percent. This drop with wilting was gradual. Porometer readings on the same leaf, but not on the area enclosed for CO_2 absorption, indicated low porosity for wilted leaves. The correlation between porosity measurements and CO_2 absorption rates was not close, however, and the action of factors other than stomatal closure in wilting leaves was indicated. Bagging the silking ear shoots to prevent pollination resulted in increases of 200–400 percent in the sugar content of the leaf blade tissue but failed to decrease the CO_2 absorption rates, indicating that photosynthesis had not been inhibited by accumulating end products. The CO_2 content of the air in a small area of corn at a level of 10–12 dm. showed a characteristic and rapid drop during photosynthesis from a night value 0.55–0.80 mg. per liter to a day level close to 0.45 mg. Air movement and soil moisture had some effect on the CO_2 content of the air, but photosynthesis appeared to be the most important factor at these altitudes. With free air around the plants depleted 25 percent below its average CO_2 content, depletion within cellophane envelopes covering test sections of leaves reached 70 percent of normal. Photosynthesis was affected surprisingly little by these low values. The highest rate of CO_2 absorption noted was obtained with a residual CO_2 content of less than 0.2 mg. per liter of air. There are 21 references.

A simplified method of growing plants with roots in nutrient vapors, L. J. Klotz. (Calif. Citrus Expt. Sta.). (*Phytopathology, 34 (1944), No. 5, pp. 507–508, illus. 1*).—Nutrient solution in a 12-l. glass jar is recirculated in vapor form over the suspended roots via a DeVilbiss atomizer operated with air pressure. The method is described in detail and illustrated.

[Abstracts of papers presented at the forty-fifth meeting of the Society of American Bacteriologists] (*Jour Bact., 47 (1944), No. 5, pp. 410–448*).—Abstracts begun on the pages indicated are included: The Metabolism of Ammonia by *Azotobacter vinelandii,* by R. H. Burris and P. W. Wilson (410), and Carbon Monoxide as an Inhibitor of Nitrogen Fixation by the Alga *Nostoc muscorum,* by P. W. Wilson and R. H. Burris (410) (both Univ. Wis.); The Utilization of Various Carbon and Nitrogen Sources by *Penicillium citrinum* Thom, by J. H. Bailey and C. J. Cavallito (411); Oxidation of Acetyl Phosphate by *Micrococcus lysodeikticus,* by M. F. Utter, L. O. Krampitz, and C. H. Werkman (412) (Iowa State Col.); The Effect of Pyridoxine on Tyrosine Decarboxylation and on Fermentation [by *Streptococcus fecalis*], by I. C. Gunsalus and W. D. Bellamy (413) (Cornell Univ.); Biological Stains—Special Problems Caused by the War, by H. J. Conn (414) (N. Y. State Expt. Sta.); Fatty Material in Bacteria and Fungi Revealed by a New Staining Procedure, by K. L. Burdon (414); Ribonucleic Acid and the Gram Stain, by J. W. Bartholomew and W. W. Umbreit (415) (Univ. Wis.); Electron Microscope Studies on *Azotobacter* Flagellation and *Rhizobium* Bacteriophage, by A. W. Hofer (415) (N. Y. State Sta.); The Influence of Chemical Agents on the Interaction of Bacterial Virus and Bacterial Cell, by R. J. Fitzgerald and D. Babbitt (416); Mutations of Bacterial Viruses Affecting the Host-Range, and Their Relation to Bacterial Mutations, by S. E. Luria (416); Observations Indicating a Sexual Mode of Reproduction in a Common *Bacterium* (*Bacteroides funduliformis*), by W. E. Smith (417); Differences Between Dissociants of Lactobacilli, by F. W. Barber and W. C. Frazier (418) (Univ. Wis.); Glucose Utilization Compared with pH Produced When Influenced by Concurrent Decomposition of Peptone by the Genus *Bacillus,* by S. R. Bozeman and F. S. Orcutt (418), and Further Evidence Demonstrating Sugar Utilization by Certain Members of the Genus *Bacillus* Where the pH of Sugar-Peptone

Media Is Not Appreciably Lowered, by F. S. Orcutt, W. B. Coffee, H. Ginsberg, and S. R. Bozeman (419) (both Va. A. and M. Col.); Biochemical and Serological Properties of *Shigella dispar,* by P. L. Carpenter (419) (R. I. State Col.); The Serological Relationship of *Phytomonas tumefaciens* and *Alcaligenes radiobacter,* by M. F. Coleman and J. J. Reid (420) (Pa. State Col.); The Outline Classification Used in the Bergey Manual for Determinative Bacteriology [With Key to the Orders and Suborders of the Class Schizomycetes], by R. S. Breed, E. G. D. Murray, and A. P. Hitchens (421) (N. Y. State Sta. et al.); Bactericidal Activity of Vegetable Juice, by C. S. Pederson and P. Fisher (421) (N. Y. State Sta.); An Antibacterial Substance [Nordihydroguiaretic Acid] From a Plant, by H. M. Tsuchiya, C. H. Drake, H. O. Halvorson, and R. N. Bieter (422) (Univ. Minn, U. S. D. A., et al.); Problems in the Production and Purification of Clavacin, by J. E. Conn and W. B. Geiger (422) (N. J. Stas.); Natural Variation and Penicillin Production by *Penicillium notatum* and Allied Species, by K. B. Raper, D. F. Alexander, and R. D. Coghill (423) (U. S. D. A.); Factors Influencing the Speed and Accuracy of a Simple Quantitative Assay Method of Testing Antibiotic Substances, by M. B. Sherwood, E. A. Falco, and E. J. deBeer (424); Penicillin—I, Methods of Assay, by W. H. Schmidt and A. J. Moyer (424), and Effect of Certain Hydrogen Ion Concentrations at Various Temperatures on a Pure Sodium Salt of Penicillin, by R. G. Benedict and W. H. Schmidt (425) (both U. S. D. A.); Bacterial Penicillinase, by H. B. Woodruff and J. W. Foster (425); Destruction of Penicillin by Bacteria, by A. Bondi, Jr., and C. C. Dietz (426); Penicillin Inactivators, by A. T. Himes and H. J. White (426); The Action of Mixtures of Germicides Against Gram-Negative Rods, by M. Pitmann (427); Antibiotic Activity as Viewed by a Mycologist, by C. Thom (428); Mode of Action of Antibiotic Substances, by S. A. Waksman (429) (N. J. Stas.); Standardization of Assay of Penicillin, by A. C. Hunter (430); Recent Advances in Our Knowledge of the Physiology of Micro-Organisms, by C. B. van Niel (431); Electron Microscopy in the Field of Bacteriology, by V. K. Zworykin, J. Hillier, and P. C. Smith (431); Substitution of Thymine for Folic Acid in the Nutrition of Lactic Acid Bacteria, by J. L. Stokes (433); A Microbiological [Yeast] Assay for Inositol, by V. Jurist and J. R. Foy (434); Studies on the Synthesis of Thiamin by Certain Strains of *Escherichia coli,* by E. F. Genung and M. E. Lee (434); A Proposed Standard Method for the Bacteriological Examination of 30–40 Mesh Edible Gelatin, by M. P. Horwood (436); Heat Activation Inducing Germination in the Spores of Thermophilic Aerobic Bacteria, by H. R. Curran and F. R. Evans (437) (U. S. D. A.); Effect of Wilting on the Fermentation of Alfalfa Silage, by R. W. Stone, J. J. Reid, P. S. Williams, and S. I. Bechdel (441) (Pa. State Col.); Microbiological Studies on Beer Cooperage, by J. B. Rehm, M. Sommer, and V. Ellerbusch (442); A Study of Cultural Methods for the Quantitative Determination of Bacterial Populations in Distillery Mashes, by J. C. Garey, L. A. Rittschof, L. Stone, and C. S. Boruff (442); Bacteriophage in a Butyl Fermentation Plant, by E. McCoy, L. E. McDaniel, and J. C. Sylvester (443) (Univ. Wis.); Variation in *Aerobacillus polymyxa* and Its Bearing on the Development of an Industrial Butylene Glycol Fermentation, by G. A. Ledingham and R. Y. Stanier (443); Bacteriophage of *Aerobacillus polymxa* in Relation to the Butylene Glycol Fermentation, by H. Katznelson and A. G. Lochhead (444); The Influence of Hydrogen Ion Concentration on the Bactericidal Action of Ozone and Chlorine, by W. W. Smith and R. E. Bodkin (445); The Temperature Coefficient of the Bactericidal Action of Chlorine, by A. M. Ames and W. W. Smith (445); Populations of Heterotrophic Bacteria in Two Sediment Layers of Western Lake Erie, by O. B. Weeks (446) (Ohio State Univ.); Hydrocarbon Production by Sulfate-Reducing Bacteria, by G. J. Jankowski and C. E. ZoBell (447), and As-

similation of Petroleum Hydrocarbons by Sulfate-Reducing Bacteria, by G. D. Novelli and C. E. ZoBell (447) (both Univ. Calif.).

The Mycetozoa of North America, based upon the specimens in the Herbarium of the New York Botanical Garden, R. HAGELSTEIN (*Mineola, N. Y.: Author, 1944, pp. 306+, illus. 84*).—In this monographic study, 285 species of the group variously denominated Mycetozoa, Myxomycetes, or Slime-Molds are described, regarded as valid, and reported from North America; the additional 33 species known for the rest of the world are listed. Introductory sections deal with the general life history and classification of the group and include a glossary of technical terms. The main body of the work (pp. 13–271) concerns descriptions of the genera and species and is provided with keys for identification. Among the illustrations, four are in color. Over 14 pages of bibliography and an index to genera and species complete the volume.

Iron deficiency in bacterial metabolism, W. S. WARING and C. H. WERKMAN. (Iowa State Col.). (*Arch. Biochem., 4 (1944), No. 1, pp. 75–87*).—Study of the enzyme systems of *Aerobacter indologenes* indicated that the catalase, peroxidase, formic hydrogenlyase, formic dehydrogenase, and hydrogenase activities are suppressed by Fe deficiency. The cytochrome bands were not visible in the Fe-deficient cells. Analysis of glucose fermentation by Fe-deficient cells showed high yields of formic and lactic acids, low CO_2 production, and no succinic acid or H gas. It is believed that an Fe-containing electron mediator operates in the formic hydrogenlyase enzyme system. There are 22 references.

An antibiotic from Aspergillus parasiticus, A. H. COOK and M. S. LACEY (*Nature [London], 153 (1944), No. 3885, p. 460*).—On the isolation of an antibiotic, resembling penicillin and tentatively designated parasiticin, which was approximately as active against a gram-positive plant pathogen [*Phytomonas fasciens*] as against *Staphylococcus aureus,* but was inactive against *Bacillus coli, B. pyocyaneus, B. prodigiosus,* and several other gram-negative bacterial species.

Some trends in research on yeasts, W. J. NICKERSON (*Chron. Bot., 7 (1943), No.* 8, *pp. 409–412*).—A brief review of some of the present and possible future trends of research on this group.

Nuclear behavior in relation to culture methods for Penicillium notatum Westling, G. E. BAKER (*Science, 99 (1944), No. 2578, p. 436*).—The variations in penicillin production by *P. notatum* and the procedures recommended by different investigators for overcoming this difficulty are briefly reviewed; in none of these accounts has nuclear behavior been considered. This is a preliminary note on the author's results from which "it would appear that at present mass spore transfer methods would offer as certain a way as any of keeping active cultures."

A standardized antibacterial pyrogen-free metabolite preparation containing living Penicillium notatum, H. E. ENOCH and W. K. S. WALLERSTEINER (*Nature [London], 153 (1944), No. 3882, pp. 380–381*).—A suspension of *P. notatum* hyphae in a fluid medium, obtained from below the mycelium of the mold at the stage of its highest rate of penicillin production and freed of pyrogens and other impurities, was found to contain also antibacterial metabolites normally present in *Penicillium* culture fluid. From its therapeutic results, it appeared that the effects of this suspension, besides the penicillin effect, are due to the presence or production of other potent bacteriostatic compounds—which are destroyed or left behind in penicillin manufacture—and to the continuation of penicillin formation in vivo.

A simplified laboratory check valve and its application in the construction of anaerobic culture tubes, A. LEVITON. (U. S. D. A.). (*Science, 99 (1944), No. 2579, pp. 455–456, illus. 1*).—An inexpensive substitute for a sintered glass filter may be readily constructed by floating mercury over a cotton or glass wool plug in the constricted portion of the tube. This valve will not permit air passage

into the tube, but will relieve the slightest pressure of gas within. The advantages and uses of the valve are discussed.

GENETICS

Two notable plant hybrids from Alaska, J. P. Anderson. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 155–157, illus. 2*).—Evidence presented leads to the conclusion that these hybrids are *Ranunculus acris* × *R. bongardii* and *Ribes bracteosum* × *R. laxiflorum.*

Cytological studies on the flax genus, Linum, C. Ray, Jr. (*Amer. Jour. Bot., 31 (1944), No. 4, pp. 241–248, illus. 43*).—Studies were made of 86 collections of the genus, including 30 species and 28 varieties of commercial flax, particular consideration being given to chromosome number, size, and shape. Five different haploid numbers were established for the genus, viz, 8, 9, 10, 14, and 15. Differences in chromosome size and morphology are also present among the species, three groups being recognized on the basis of size; taking size and number together, seven different karyotypes were recognized. The commonest haploid number observed was $n = 9$; the next commonest, $n = 15$. The species with either of these numbers accounted for 72 percent of those examined. Commercial flax has a chromosome number of $n = 15$; its extreme polymorphism is thus not correlated with any differences in chromosome number. There are 29 references.

The linkage relations of four genes in chromosome I of barley, S. P. Swenson and D. G. Wells. (Wash. Expt. Sta.) (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 429–435*).—Inheritance and linkage relations of tall v. short and high v. low number of rachis internodes were studied in relation to two marker gene pairs in chromosome I of barley, non-six-rowed v. six-rowed spikes (*V v*), and awnless v. awned outer glumes (*E e*). Plant height was governed by one main gene pair, *H h,* and a modifier pair, $H_1 h_1$ Rachis internode number was conditioned by one main gene pair, *Rin rin,* and a modifier pair, Rin_1 rin_1. Both *H h* and *Rin rin* could be isolated for study of linkage relations. The order and recombination percentages of the four genes were found to be *v* — 17.1 — *rin* —12.8 — *h* — 8.1 — *e*. Addition of *rin* and *h* to the map of chromosome I increased the number of mapped genes to nine which occur in the order *tr* —*v* — *rin* — *h* — *e* — *y* — *f* — *lg* — *or.*

Linkage of green-striped-2 in sorghum, J. C. Stephens. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 469–470*).—Green-striped-2 (gs_2) develops in the leaves a few days after seedlings emerge, appearing as pale-green stripes between the main vascular strands. The pale stripes gradually disappear and the tissue becomes green before the leaf reaches its ultimate size. Plants of green-striped-2 do not vary much within or between populations, and the stripes are not so distinct as those of green-striped-1 (gs_1) (E. S. R., 80, p. 605). Other characteristics of individuals are abundant tillering and small stature. Segregations showed gs_2 to be a single-factor character and independent of gs_1. Cross-over percentages indicated that gs_2 and *a* (awns) are on opposite sides of ms_2 (male sterility) and add gs_2 to the ms_2—*a*—v_{10} linkage group.

X-ray and ultraviolet studies on pollen tube chromosomes.—I, The effect of ultraviolet (2537 Å) on X-ray-induced chromosomal aberrations, C. P. Swanson. (Mich Expt. Sta.). (*Genetics, 29 (1944), No. 1, pp. 61–68*).—In a study of the effect of ultraviolet light (2537 a. u.) on the production of X-ray breaks in the pollen tube chromosomes of *Tradescantia,* pretreatment 1 hr. before X-irradiation led to an inhibition of all types of visible X-ray breaks, single deletions and translocations being more affected than double ones. The degree of inhibition depended on the dosage of ultraviolet used. Posttreatment had no inhibitory effect on double deletions regardless of time of application. Translocations showed

considerable inhibition when posttreatment was given immediately after X-irradiation, slight inhibition when given 0.5 hr. later, and no inhibition when given 1 hr. afterward. Single deletions were inhibited even after the 1-hr. posttreatment, suggesting that the ultraviolet facilitates restitution. The action of ultraviolet is probably not immediate, and it is believed further that the inhibition therefrom is caused by an effect produced on the chromosome matrix which leads to its greater resistance to X-ray breakage.

The randomness of chromosome distribution at anaphase I in autotriploid Lolium perenne L., W. M. Myers. (U. S. D. A. coop. Northeastern States). (*Bul. Torrey Bot. Club, 71 (1944), No. 2, pp. 144–151, illus. 5*).—The occurrence and position of univalents at metaphase I and the assortment of chromosomes at anaphase I were studied in microsporocytes from two autotriploid plants of perennial ryegrass. In 84 percent of 2,494 metaphase I sporocytes, 1–5 univalents were found; of these, 1 was oriented on the equatorial plate in 22 percent of the sporocytes, 2 oriented in 7 percent, 3 in 0.9 percent, and 4 in 0.2 percent. In sporocytes with two or more unoriented univalents, the latter lay in the sporocyte at random relative to one another and to the equatorial plate. The chromosome distribution in 1,636 anaphase I sporocytes was consistent with the assumption of chance position of the metaphase I univalents and random assortment of the extra chromosomes of the trivalents. The behavior in triploid *L. perenne* differed from that found in triploid *Datura stramonium* by S. Satina and A. F. Blakeslee.

On the number of chromosomes in Hevea, E. F. Paddock. (Ohio State Univ.). (*Chron. Bot., 7 (1943), No. 8, pp. 412–413, illus. 1*).

The shattered dream of a corn breeder, F. D. Richey. (U. S. D. A. and Tenn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 3, pp. 267–268*).—An eight-stanza account of elimination of corn inbreds.

Amount of natural out-crossing in the castor oil plant, W. E. Domingo. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 4, pp. 360–361*).—Outcrossing averaging 36 percent was obtained by growing castor-bean plants homozygous for spineless, a simple recessive gene among plants homozygous for the spined dominant allelomorph, and observing in resulting progenies the percentage of plants that carried the dominant gene. White's estimate (E. S. R., 40, p. 435) was about 5 percent. The strain bearing the spineless character was developed at the Illinois Experiment Station.

The nature and inheritance of sterility in sweet clover, Melilotus officinalis Lam., R. E. Gettys and I. J. Johnson. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 3, pp. 228–237), illus. 2*).—F_1 progeny from a cross of two self-sterile but cross-fertile plants of biennial *M. officinalis* was found to be self-incompatible, although some pods were formed by most plants as a result of selfing. When the two self-sterile parents were selfed for four consecutive 10-day periods, one, but not the other, showed a significant difference in pod set. When 19 F_1 progeny of the self-sterile parents were reciprocally backcrossed to both parents, 9 were cross-compatible with one parent and cross-incompatible with the other parent and 10 were cross-compatible with both parents. The results were explained by the oppositional factor type of sterility in which it was assumed that the parents had one sterility allel in common. Crosses between plants within the same F_1 group were incompatible and crosses between plants of different F_1 groups were compatible, thus verifying the proposed genotypes. The F_1 plants from the cross of an inbred self-fertile annual line of *M. officinalis* and the self-sterile plant proved to be self-fertile, as did also F_2 population of 139 plants grown from the F_1. The results indicated that self-fertility was dominant over self-sterility, and that in the heterozygous F_1 only pollen tubes with the S_f gene can penetrate the style and cause fertilization.

Self- and cross-fertility relationships and cytology of autotetraploid sweet clover, Melilotus alba, I. J. Johnson and J. E. Sass. (Iowa Expt. Sta.). (*Jour. Amer. Soc., Agron., 36 (1944), No. 3, pp. 214–227, illus. 6*).—Autotetraploid plants of biennial white sweetclover produced by submerging the cotyledons and terminal bud in 0.05-percent colchicine solution for 6 hr. had larger vegetative and floral organs, larger leaf and root cells, larger pollen grains, and larger somatic nuclei than the diploids. Periclinal chimeras and islands of tetraploid tissue occurred in roots of treated plants. Histological organization of leaves and roots of diploid and tetraploid plants, except for cell size, was identical. Chromosome lagging at the first meiotic metaphase ranged from complete absence of irregularity to markedly irregular distribution. The most chromosomes in a telophase group was 19, the least 12. Univalent, bivalent, quadrivalent, and rare trivalent associations have been observed. Tetraploid plants varied significantly in self-fertility, indicating a possibility of selection for higher levels. Significant differences, obtained in cross- and self-fertility in 4 of 32 matings, could not be explained on the basis of pollen condition or of lack of normal egg cells. F_1 plants from crosses between parents differing in self-fertility showed significant variability in self-fertility.

The occurrence of a tetraploid and two triploid apple seedlings in progenies of diploid parents, J. Einset. (N. Y. State Expt. Sta.). (*Science, 99 (1944), No. 2574, p. 345.*).—If the true frequency of spontaneous occurrence of triploids and tetraploids in apples approaches the frequency here reported in a population of only 278 seedlings, it would seem a relatively easy matter to obtain these forms.

The pantothenic acid and riboflavin in the fresh juice of diploid and tetraploid grapes, M. B. Smith and H. P. Olmo. (Univ. Calif.). (*Amer. Jour. Bot., 31 (1944), No. 4, pp. 240–241*).—In studies of the pantothenic acid and riboflavin content of fresh grape juice from the original diploid and the derived autotetraploid varieties, no significant differences were found. There were significant differences, however, in the pantothenic acid content between varieties, with a higher average content occurring in the juice of interspecific hybrids of *Vitis labrusca* × *V. vinifera* parentage than in European varieties derived from *V. vinifera.*

Induced tetraploids of a self sterile Oenothera, A. Hecht (*Genetics, 29 (1944), No. 1, pp. 69–74, illus. 2*).—Tetraploidy was induced in a self-sterile race of *O. rhombipetala* by colchicine treatment. Analysis of the inheritance of the self-sterility alleles in these tetraploids revealed a mechanism based on opposing sterility alleles according to the general scheme of East and Mangelsdorf (E. S. R., 55, p. 27). Successful matings resulted only when the potential seed parent contained none of the self-sterility alleles present in the pollen; this is satisfactorily explained by assuming that the original diploid plants which became tetraploid on colchicine treatment differed from each other by only a single self-sterility allel.

Genetics of Glomerilla.—I, Studies on the behavior of certain strains, G. B. Lucas, S. J. P. Chilton, and C. W. Edgerton. (La. State Univ.) (*Amer. Jour. Bot., 31 (1944), No. 4, pp. 233–239, illus. 5*).—Ascogenous cultures were isolated from five different host plants; by isolating ascospores, the minus strain was easily obtained from each culture. From a large number of ascopores of the plus strain isolated, a few developed into strains differing from either ordinary plus or minus. From a culture originally isolated from *Ipomoea,* seven distinct strains including the ordinary plus and minus were in this way obtained. From sectors in single-spore cultures, strains similar to certain ones developing from single ascospores of the plus strain were also isolated. Some of them differed from the parent as regards the presence or absence of perithecia, of normal ascospores, or of conidia, as well as in the shape of the conidia. In isolating ascospores from the plus strain, it was found that an individual ascus usually contained either four ascospores each of the plus and minus strains or else eight of the minus strain. Based on somewhat limited evidence, it

was found that the asci in a single perithecium were usually alike as regards the ratio of the different strains in an ascus, suggesting that the constitution of the ascus is usually determined previous to the formation of the ascogenous hyphae. When ascospores of the minus strain were isolated, colonies of this strain only were obtained. Also, ascospores of a strain called the "fertile minus"—differing from the minus in producing numerous well-developed asci and ascospores—produced only fertile minus colonies. When planted in the same plate, a ridge of well-developed perithecia formed very rapidly on the line of contact between the plus and minus and between the plus and fertile minus strains. Some of the other strains produced perithecia, though much more slowly, on the line of contact when grown with the plus or the minus; at least one of them produced such a line with both plus and minus. In the cultures studied, a ridge of perithecia failed to develop on the contact line between the plus strain from one host and the minus from another.

Rate of conception in beef cows pasture-bred during a controlled breeding season, A. O. Rhoad. (U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 154–158, illus. 1*).—During 12 successive years, pasture breeding records of purebred and crossbred cows at the Iberia Livestock Experiment Farm, Jeanerette, La., showed that there were 563 calves produced, 62 abortions, and 207 infertile matings. Although actual matings were not observed, a method was adopted for calculating that 52 percent of the cows giving birth to normal living calves became pregnant within the first 20 days of the breeding season. Within 40 and 60 days there were pregnant 80 and 90 percent, respectively, and by the end of 120 days all cows dropping normal calves were pregnant. Slightly more than half of the cows calved within 70 days of the start of the breeding season. Only 8, or 1.4 percent, calved after the breeding season started. There was no material difference in the rate of conception for heifers and cows. Of the 563 normal births, 90.1 percent were crossbred Brahman × Angus or Africander × Angus calves, and 9.9 were purebred Angus.

Hereditary heartwater-resistant characters in cattle, J. C. Bonsma (*Farming in So. Africa, 19 (1944), No. 215, pp. 71–96, illus. 13*).—The acquisition of a passive immunity to heartwater in calves whose dams were naturally immunized does not seem to have occurred. Among a total of 728 calves, 7.7 percent from cows of heartwater-free areas, 10.3 percent from those of heartwater areas, and 6.1 percent from cows at Mara Experiment Station died. Differences in mortality from these groups were not statistically significant. Highly significant differences were observed in the mortality of Africander and exotic breeds among those born at this experiment station. As the percentage of Africander breeding was increased, the percentage of mortality decreased, as did also the numbers of blue ticks (*Boophilus decoloratus*) on eight 200-sq.-cm. areas of 12 head of the exotic breeds—Africander and crossbred cattle. The Africander cattle that died succumbed at more advanced ages, suggesting that this breed shows a greater resistance to the disease. There were 9 times as many blue ticks and 60 times as many heartwater ticks per unit of surface on the escutcheon as on the body. Skin thickness and type of coat apparently played an important role in tick-repellent capacity of the animal.

A comparison of inbreeding and outbreeding in Holstein-Friesian cattle, J. W. Bartlett and S. Margolin (*New Jersey Stas. Bul. 712 (1944), pp. 28, illus. 5*).—A summary is presented of the effects of inbreeding and outbreeding on growth, production, and health of the Holstein-Friesian herd over the 10-yr. period 1931–41. The analysis was made by cow families by means of the graphic system of Bartlett et al. (E. S. R., 88, p. 610) and by statistical treatment. Specific cow families and sires transmitted genetic factors for superiority in size, type, and milk and fat production. From the results it appears that dairy cattle can be inbred up to a coefficient of 0.20 without reducing frame size as measured by

height or heart girth. All inbred animals up to 0.20 were superior in type to outbreds. The undesirable recessive factors were eliminated by inbreeding and selection, and it should be possible to increase the coefficient of inbreeding beyond 0.20 without detrimental effects. The animals inbred to a greater coefficient were inferior in size and milk production, but the type and butterfat tests were superior to outbred controls by the same sires. Total fat production was higher for outbreds than for inbred progeny of the sires. Outbreeding increased total fat and inbreeding maintained it. Inbreeding improved the fat test twice as much as outbreeding without significantly modifying milk production, but families differed. More progress was made from outbreeding certain highly superior inbred bulls than by further inbreeding them. Improvement from outbreeding superior inbred sires markedly surpassed improvement from outbreeding of outbred sires. The results were based on the body weights, wither height, and heart girth of 67 outbred females and 76 inbred daughters of 4 sires taken at 2 yr. of age and 21 outbreds and 24 inbred daughters of these sires taken at 5 yr. of age. The milk and fat production of such of these animals as survived were also presented with reference to the inbreeding coefficients.

Modification of mating season in sheep by light treatment, J. F. Sykes and C. L. Cole (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 250–252*).—Eight ewes, mostly yearlings of the Rambouillet, Southdown, and Hampshire breeds and crossbreds between the Rambouillet and Cotswold breeds were placed in February with a ram in a pen equipped for lighting. The hours of supplemental light were gradually increased until 3 hr. were added per day and then decreased in late March, April, and early May until the sheep were deficient 6 hr. of daylight. Four yearling and one mature ewes were mated with the ram before May 15, and five lambs were produced by November 5. Another ewe aborted and two failed to breed. The lambings were considered 4 to 5 mo. early and must have resulted from matings in early June.

Comparison of growth in Karakul and mutton breeds of sheep, V. L. Simmons. (U. S. D. A. et al.) (*Jour. Anim. Sci., 3 (1944), No. 1, pp. 50–58, illus. 2*).—Weights at birth and at 13, 26, and 52 weeks of age for lambs born in the flocks at the U. S. D. A. Beltsville Research Center showed that Karakul × Black-faced Highland and Karakul × Corriedale lambs were smaller than Hampshires but larger than Southdowns, Shropshires, and Corriedale lambs at practically all ages. There were significant differences in gains. In general, the Karakul and crossbreds showed a greater similarity in weights to the Hampshires than to the other breeds. After adjusting for differences in average birth weights between breeds, the Karakul showed greater similarity in rate of growth to the Corriedale and a much slower growth rate than the Hampshire. The Karakul crossbreds ranked in the same order for rate of gain with the other breeds as the purebreds. The ability of Karakul and Karakul crossbreds to grow at a rate comparable with some of the best mutton breeds is striking. Averages are presented for the weights of 0 to 79 lambs of each sex for each of the breeds.

The genetics of the Wensleydale breed of sheep.—III, Arithmetical aspects of selection, F. W. Dry (*Jour. Genet., 45 (1943), No. 3, pp. 265–268*).—Continuing this series (E. S. R., 77, p. 35), it was found that in this breed white is a simple dominant to black. By selection for the blue shade of rams, the breed has reached an equilibrium so that 58.58 percent of the white lambs born are heterozygotes. From a statistical analysis of likelihoods and observations, it was calculated that 8 percent of the total power of selection in white-wooled ewes was employed against homozygosity for white. The percentage of recessives born is kept constant at 14.64 by perfect selection of heterozygotes on the male side alone, with rejection of recessives on the female side.

Selection for growth rate of pigs and productivity of sows, G. E. Dickerson and L. N. Hazel. (Iowa and Nebr. Expt. Stas. and U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 201–212, illus. 2*).—"The effectiveness of different methods of selecting for improved growth rate of pigs and productivity of sows is compared. Data used are from the Iowa and Nebraska Station swine herds maintained in cooperation with the Regional Swine Breeding Laboratory. From 8 to 10 times as many boars, and about 3 times as many gilts, as are needed for breeding should be retained long enough after weaning to obtain a measure of growth rate that is more reliable than weaning weight. The rest may be culled at weaning without reducing the effectiveness of selection appreciably. Several plans for culling sows, differing in the number of litters produced before and after culling and in the number of farrowing seasons each year, are compared. Yearly progress from selection is greatest when sows are culled after the first litter, the best one-third to one-half being kept for a second litter 6 mo. after the first. A plan almost as good is that of delaying culling until after the second litter and keeping the best one-fifth to one-fourth of the sows for a third litter 2 yr. of age. Progress is retarded by retaining more than the optimum proportion of older sows, because the less intense culling of sows and the longer interval between generations is only partly offset by the more severe culling of gilts and the greater accuracy of sow culling. Having sows farrow two litters per year is definitely advantageous. It permits the accuracy of selecting boars and gilts to be improved by basing the dam's productivity on two litters instead of one. It also means that the more productive sows may be kept for additional litters with a minimum increase in average interval between generations."

The melanins.—I, Studies of the hair pigments of the guinea pig, M. R. Baker and A. C. Andrews. (Kans. Expt. Sta.). (*Genetics, 29 (1944), No. 1, pp. 104–112, illus. 1*).—Evidence was found that qualitative differences exist between different black guinea pig pigments. Black guinea pig melanin and red pigment were easily distinguished by the use of regression coefficients for the log optical density plotted against wave length. The curve for solutions of black melanin prepared by boiling in 1 percent NaOH for 2 hr. decreased in height after standing 24 hr., and its slope shifted toward the characteristic of the red pigment. The regression coefficient for the intense chocolate pigment falls within the range for different dilute black melanins. It is therefore concluded that the chocolate pigment and black melanins are chemically alike and that the *B* locus probably determines some difference in physical state of the pigment present. Indications are presented that the red pigment is an oxidation product of black melanin, and this difference is related to the *E* locus in terms of Wright's hypothesis (E. S. R., 38, p. 776). Pigments of different grades and genotypes were extracted as indicated.

Linkage studies of the rat (Rattus norvegicus), VI, W. E. Castle and H. D. King. (Univ. Calif. et al.). (*Natl. Acad. Sci. Proc., 30 (1944), No. 4, pp. 79–82*).—Continuing this series (E. S. R., 86, p. 766), kinky (*k*), a recessive mutant gene discovered by Feldman (E. S. R., 75, p. 610), was found to be linked with the mutant stub (*st*) (E. S. R., 87, p. 497), making a fourth linkage group in the rat. A total of 138 outcrossed females, the progeny of matings of heterozygotes for the two characters with tested F_1 males, showed the presence of gametes carrying *k, st, k st,* and none of these genes in the proportions of 66, 25, 11, and 36, respectively, There were thus 47 cross-overs and 91 non-cross-overs. The cross-over percentage was 34.1 ± 2.6, locating these genes near opposite ends of the chromosome. In getting further information on the order of the second linkage group, F_1 animals of the genetic formula $\frac{Cu\ an\ +}{+\ +\ in}$ were outcrossed to animals free of these three mutant genes. A total of 175 progeny backcrossed to F_1s produced 65 *Cu an* (non-cross-

over) and 76 *in* (cross-over) individuals. From the six cross-over genotypes, three arrangements were given of which the preferred was $\frac{Cu\ an \quad in \quad b}{0 \quad 10.3 \quad 24 \quad 45}$.

Atlas of avian anatomy: Osteology, arthrology, myology, F. W. CHAMBERLAIN. (Coop. U. S. D. A.). (*Michigan Sta. Mem. 5 (1943), pp. 213+, illus. 95*). Details and illustrations, including a large number of drawings, are presented on the bones, joints, and muscles of birds.

Weight-growth curves, G. A. BAKER. (Calif. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 2, pp. 83–90, illus. 1*).—Growth curves are of undoubted value for studies of heredity, physiology, and management for economic production, but due account must be taken of the effects of variable environmental conditions on growth. Examples are cited from several sources, including especially data of Tepper (E. S. R., 77, p. 527) on New Hampshire chickens. A fair number of birds should be individually weighed. Mortality was a complicating factor. The purpose for which the weight growth is used must be considered. It is much simpler and more satisfying to have a single simple graduating formula than to have a succession of formulas each valid for a limited range.

Yolk estrogen and humerus pneumatization in chicks, W. LANDAUER. ([Conn.] Storrs Expt. Sta.). (*Endocrinology, 34 (1944), No. 4, pp. 297–299*).—Pneumatization of the humerus of chicks is not under the control of yolk estrogen. Sections of the humeri at 21 and 25 days of age were similar from six chicks having the yolk sacs removed at hatching to the effects observed in six controls.

Avian spare yolk and its assimilation, A. L. ROMANOFF. ([N. Y.] Cornell Expt. Sta.). (*Auk, 61 (1944), No. 2, pp. 235–241, illus. 2*).—Study of several species of birds showed the relative amounts of spare yolk at hatching to vary with the size of the egg. The weights of the spare yolk retained also varied with temperature departures from the standard of 37.5° C. Feeding and starvation seemed to have little if any influence on assimilation of the yolk. Physical and chemical changes in the spare yolk indicated preferential absorption of fats. The study included egg weights and weights after hatching up to 5 days of age of bobwhites, ruffed grouse, ring-necked pheasants, jungle fowl, guinea fowls, mallards, Leghorn and Brahma chickens, Runner and Pekin ducks, White Holland and Bourbon Red turkeys, and Emden geese.

The failure of ascorbic acid to augment equine gonadotropin in the rat, J. O. ALMQUIST and F. N. ANDREWS. (Ind. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 183–187*).—The simultaneous injection of 24- and 70-day-old male and female rats with 25 rat units of equine gonadotropin and 50 mg. of ascorbic acid had no greater effect on the size of gonads than had the gonadotropins alone. The younger-age rats were injected for 4 days and the older rats 20 days each.

The estrogen-progesterone induction of sexual receptivity in the spayed female mouse, J. R. RING (*Endocrinology, 34 (1944), No. 4, pp. 269–275*).—The mouse appears to be another of the species in which estrus is the result of a conditioning effect of estrogen followed by the action of progesterone secreted by the ovarian follicle prior to ovulation. The optimum amount of progesterone is 0.05 mg., and the optimum time interval between injections is 48 hr. The experiments involved studies of mating of 150 spayed female mice placed with males in some cases several times. The females were injected with doses of estradiol benzoate varying from 1 to 100 rat units.

A variable physiological factor necessary for the survival of bull spermatozoa, J. F. LASLEY and D. T. MAYER. (Mo. Expt. Sta., U. S. D. A., et al.). (*Jour. Anim. Sci., 3 (1944), No. 2, pp. 129–135*).—Semen was collected from three bulls in Missouri and six range bulls in Arizona in an artificial vagina. In addition

sperm were flushed with M/8 phosphate buffer solution (E. S. R., 89, p. 49) from the tails of the epdidymis of seven range bulls castrated in Arizona. The resistance to adverse conditions was estimated by subjecting 124 ejaculated samples undiluted and 82 ejaculated samples diluted with egg-yolk diluter to a cold shock of 0° C. for 10 min. and ascertaining the survival by the staining method of Lasley, Easley, and McKenzie (E. S. R., 87, p. 500).

These data show that the variable survival of bull spermatozoa depends upon a variable physiological factor which influences resistance to adverse environmental conditions. There was a relationship between the survival to storage and the resistance to low temperature shock. The storage potentialities of undiluted semen depends on the number of resistant sperm present at the time of ejaculation, but the storage potentialities of semen diluted with egg yolk are dependent on the number of sperm at ejaculation in addition to those resistant. Epididymal sperm were much more resistant to low-temperature shock than ejaculated sperm, but evidently a varying proportion of sperm maintain the epididymal resistance until they are ejaculated. Marked difference was found in the survival time and resistance to low-temperature shock in sperm from the Missouri and Arizona bulls. The differences were largely eliminated when egg-yolk phosphate diluter was employed.

Artificial insemination of dairy cows, H. B. ELLENBERGER (*Vermont Sta. Pam. 12 (1944), pp. 7*).—The number of dairy cows artificially inseminated in the United States by artificial breeding associations has progressively increased from 7,539 in 1939 to 182,524 in 1943. Possible advantages and disadvantages of artificial insemination in dairy cattle, which has had variable success in Vermont, are pointed out.

FIELD CROPS

[Crop production in Kansas] (*Kans. State Bd. Agr. Rpt., 63 (1944), No. 260, pp. 25–48*).—Agronomic papers presented at the meeting of the Kansas Agricultural Convention, Topeka, on January 12–14, 1944, include An Over-All View of Crop Production, by R. I. Throckmorton (pp. 25–30) (Kans. State Col.); Western Kansas Practices, by H. C. Jackson (pp. 31–35); Central Kansas Practices, by E. Mahoney (pp. 35–37); Eastern Kansas Practices, by G. J. Fuhrman (pp. 38–39); The Seed Question in Crop Production, by P. Ijams (pp. 40–45); and Adapted Crop Varieties as Related to Production and Use, by A. L. Clapp (pp. 45–48).

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 5, pp. 1, 2, 5, 6, illus. 3*).—Progress of experiments with field crops is set forth in articles on Alyce Clover: Yields of Hay and Feeding Results, by H. W. Bennett (pp. 1, 2); Vetch Cut for Hay Compared With Vetch Turned—Yield, Total Worth, by J. L. Anthony (p. 2); C. P. 29–116 Again Leads Poplarville Sugarcane Yields, by T. E. Ashley (p. 2); 750 Pounds 6–8–4, Plus Nitrogen-Potash Top-Dressing, for Starch Sweetpotatoes, by W. S. Anderson (p. 5); and Soys Best Planted April 15 to May 15, Delta Tests Show, by R. B. Carr (p. 6) (coop. U. S. D. A.).

Small grain varietal experiments for southern Arizona, A. T. BARTEL. (Coop. U. S. D. A.). (*Arizona Sta. Bul. 191 (1944), pp. 21, illus. 3*).—Wheat variety tests at Mesa, 1931-41, suggest that Baart 38, a stem rust- and bunt-resistant spring wheat, be grown in the lower valleys in southern Arizona, and White Federation 38 in the Yuma Valley. Arivat barley outyielded Vaughn at Mesa by about 9 percent, although Vaughn made higher pasture yields in clipping tests at Tucson. California Red surpassed other oats varieties in grain yields, but Markton produced higher yields of hay at Mesa and higher clipping yields at Tucson.

Markton also outyielded Vaughn barley by 39 percent (4-yr. average) in the clipping tests. Gross returns from Vaughn barley, averaging 4,171 lb. per acre, were estimated at $45.05 per acre, and from Baart wheat, 2,934 lb., $39.02. Agronomic characters of important varieties are described.

The incompleteness of some ecological grassland studies, G. N. Wolcott. (P. R. Univ. Expt. Sta.). (*Science, 99 (1944), No. 2579, pp. 449–450*).—Examples of effects produced by specific members of the wild animal life, insects, etc., of grasslands are cited to illustrate the need for including them in ecological studies of pastures and meadows if these are to be considered at all complete.

Effect of prolonged spring grazing on the yield and quality of forage from wild-hay meadows, G. Stewart and I. Clark. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 3, pp. 238–248, illus. 1*).—Three wild-hay meadows at Big Piney, Wyo., were grazed annually, 1936-42, from beginning of growth to about May 3, May 26, and June 9, respectively. Each year in late July or early August, each field and the crop harvested were sampled. Average yield and quality of forage were obtained by analysis of samples and calculation of amount of forage consumed on the basis of numbers and classes of cattle grazed. When the pasturage was added to the hay crops, total average yields were considerably higher for areas grazed the longer periods. Total average forage yield was 1.79, 1.89, and 1.93 tons per acre for fields grazed to early, mid-, and late spring, respectively. Crude protein percentages for 7 yr. averaged 8.13, 8.25, and 9.05 for hay grown after early, mid-, and late grazing, respectively; average acre yields of crude protein 291.1, 311.9, and 349.3 lb. per acre (in relative numbers 100, 107, and 120); and relative yields for "total" mineral content were 100, 110, and 116.

Wild-hay quality as judged by leafiness, stemminess, color and protein content was affected materially by stage of plant maturity at harvesttime. Best quality resulted when hay was cut before grasses and sedges were fully mature. Reduction of 0.2 ton per acre in average yield of hay from units grazed until early June as compared with those grazed only until early May was more than compensated for by greater total forage yield and increased protein content. In fact, hay from each acre of meadow grazed until early June is estimated to have furnished the equivalent of about $2.70 worth more crude protein than hay cut from meadows on which grazing ended earlier, with additional value in the greater vitamin content known to parallel protein content.

Satisfactory hay yields in dry years, after prolonged spring grazing, have depended on the supply of irrigation water late in the season. Since this water comes largely from snow in the mountains, snow surveys make it possible to gage the probable water supply and the best date for stopping spring grazing.

Determination of soil drought resistance in grass seedlings, D. F. McAlister. (U. S. D. A. coop. Utah Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 4, pp. 324–336, illus. 2*)—Grass seedlings were grown for 6–8 weeks in the greenhouse, and then received a soil drought treatment lasting from 6 to 9 days in a chamber designed to maintain constant environmental conditions of temperature (80° F.), light (175 footcandles), relative humidity (30–35 percent), and air velocity (0.5 mile per hour). The percentage of plants renewing growth under favorable growing conditions in the greenhouse is used as the index of relative drought resistance of a species or strain. In preliminary trials of over 96,000 grass seedlings under treatment, average survival values for species agreed with their known behavior under natural conditions of critical drought. Satisfactory correlation between field and greenhouse survival was obtained where comparisons were possible. The wide range of seedling survival found between strains within species suggests the possibility of breeding for soil drought resistance and the dangers of characterizing a species as to drought resistance from observations on a single strain or seed source.

Seed dormancy and germination in some native grasses, C. J. Coukos. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 4, pp. 337–345, illus. 1*).—Germination tests on many accessions showed that seeds of big bluestem, little bluestem, and Indian grass possessed prolonged dormancy. Some lot of side-oats grama and a Kansas selection of little bluestem had brief dormancy. Under ordinary storage seeds with prolonged dormancy give very low laboratory germination in the first spring and consequently poor stands in plat seedings. Such seeds cannot be spring sown successfully until the second spring after harvest, while seeds with brief dormancy may be used in the first spring. Seeds of these grasses stored in barn loft or at room temperature in bags or in jars did not begin normal germination until from 14 to 18 mo. after harvest. After dormancy broke, germination remained at a high average for several months. Usually seeds stored in bags retained good viability only for about 10 mo. after break of dormancy, while those stored in jars remained viable for at least 20 mo. afterward. Dry cold storage extended the dormancy of these species except in some accessions of big bluestem. Cold storage in bags shortened the life span of seeds after break of dormancy, but life of seeds stored in jars was prolonged for at least 38 mo., except for Indian grass (24 mo.).

Making a burned range work for victory, I. D. Nicholas and R. C. Bergeson (*U. S. Dept. Agr., Soil Conserv., 9 (1944), No. 12, pp. 280–282, illus. 2*).—Establishment of forage grasses by seeding burned areas in the intermountain semiarid range lands under conditions similar to those existing on a burned area near Boise, Idaho, was found both feasible and practicable. The seed mixture, drilled in October, consisted of crested wheatgrass 2.5 lb., bulbous bluegrass 2.5, and biennial sweetclover 1 lb. per acre. Winter rye was seeded in half of one drill, forming a 5-ft. strip as a wind erosion control measure.

Good pastures, A. T. Semple and M. A. Hein (*U. S. Dept. Agr., Farmers' Bul. 1942, rev. (1944), pp. 22+, illus. 21*).—The publication noted earlier (E. S. R., 89, p. 536) has been slightly revised.

Eight years' results on the effectiveness of fertilization and management in increasing the production of permanent pastures, H. L. Ahlgren, I. W. Rupel, G. Bohstedt, and E. J. Graul. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 4, pp. 301–315, illus. 1*).—Production of permanent pastures continuously grazed (field 1), continuously grazed and fertilized annually with calcium cyanamide (field 2), rotationally grazed and fertilized annually with calcium cyanamide (field 3), and rotationally grazed and maintained in alfalfa and Kentucky bluegrass (field 4) was compared, 1935-42.

Evaluations of the fields on yields of dry matter and crude protein, grazing days, and total digestible nutrients indicated that production of permanent pastures can be increased materially and profitably by N fertilization and by alfalfa reestablished periodically by renovation. Yields of dry matter and crude protein tended markedly to decrease as the pastures aged on fields 2, 3 and 4 and were generally lower 1939-42 than during 1935-38. Maintaining permanent pastures indefinitely on productive, nonerodable cropland evidently may not be justified if maximum productivity is desired. For highest forage yields, occasional plowing (productive, nonerodable soils), or renovation (unproductive, erodable soils) followed by adequate fertilization and reestablishment of grasses and legumes may be needed in humid areas where legumes are not maintained readily.

Fields 2, 3, and 4 were found more productive than field 1 by all methods of evaluation used. No significant differences were noted in production of fields 2 and 3, but their average annual production was 9.9 and 14.6 percent greater on the basis of grazing days and total digestible nutrients per acre, respectively, than that of field 4. Increased acre yields of total digestible nutrients were produced

at an average of 83 ct. per 100 lb. in fields 2 and 3 and 45 ct. in field 4. These fields usually were available for grazing from 5 to 7 days earlier in the spring and for a longer period in midsummer than field 1. Calcium cyanamide was less effective in increasing yields of dry matter and crude protein in dry years than in moister years.

Forage yields produced by redtop and timothy in fields 1, 2, and 3 decreased each year, 1935-39, and in field 4 were unimportant after 1936. Forage yields of red, alsike, and white clovers were very low in all fields after 1937. Kentucky bluegrass had become the dominant species in the sod in fields 1, 2, and 3 by 1937 and in field 4 by 1938. Its yields increased each year in all fields 1935-38, but were not proportionate to decreases in yields of other species. Sods of fields 2 and 3 did not differ much in botanical composition. More plants of redtop, timothy, and the clovers persisted in field 1 than in either field 2 or 3.

Growing alfalfa in Colorado, R. M. Weihing, D. W. Robertson, O. H. Coleman, and R. Gardner (*Colorado Sta. Bul. 480 (1943), pp. 36, illus. 14*).—The information on the status of alfalfa in Colorado; production practices; alfalfa varieties; making and stacking hay; hay quality; uses of alfalfa for silage, pasture, and orchard cover; seed production; and alfalfa diseases and insect pests supersedes that presented in an earlier publication (E. S. R., 81, p. 37).

Alfalfa needs added potash on some New York State soils, R. F. Chandler, Jr., and A. F. Gustafson. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, p. 15, illus. 1*).—Tests on a number of soils in different localities suggested that if one-fifth or more of otherwise healthy plants of alfalfa show distinct K-deficiency spots, 200 or 300 lb. per acre of 60 percent potassium chloride applied in alternate years may pay well. Manure, 6 or 8 tons per acre annually, or 10 tons in alternate years, has given marked benefits. Absence of K-deficiency symptoms on alfalfa otherwise well fertilized means that potassium chloride seldom returns paying yield increases, particularly if plenty of manure has been applied regularly in the past or is put on alternate years.

Barley varieties registered, IX, H. K. Hayes. (Univ. Minn.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, p. 444*).—An additional variety approved for registration (E. S. R., 89, p. 205) is Glacier, a six-rowed, white-seeded, hulled, semi-smooth-awned barley. Selected from Atlas × Vaughn, it makes high yields, has stiff straw, and is highly resistant to covered smut.

El mejoramiento de nuestras habichuelas (datos preliminares) [Bean improvement (preliminary report)], A. Riollano (*Puerto Rico Univ. Sta. Mimeog. Rpt. 25 (1944), pp. 4+*).—Results in bean variety tests at Isabela and Rio Piedras during 8 yr. indicated that importation of seed from latitudes distinct from that of Puerto Rico cannot be recommended. Varieties from the United States have been consistently inferior to native varieties and selections. Yields of native beans in variety and spacing tests are tabulated, together with analyses of five varieties.

Twelve points in grading dry edible beans (*U. S. Dept. Agr., 1944, AWI-99, pp. 12, illus. 29*).—The several points for determining bean grades are described and illustrated, with tables showing grade requirements for all classes of beans.

Seed setting in red clover, J. N. Bird (*Jour. Amer. Soc. Agron., 36 (1944), No. 4, pp. 346–357, illus. 1*).—Seed setting, based upon number of seeds per head, was studied at Macdonald College, Que., 1938-42, with a strain of early, double-cut red clover in which natural blooming period was extended greatly by cutting treatments at week intervals in June. Heads were tagged at about 2-day intervals. Seed setting was rather low in the first growth, gradually declining to a marked low level during late June and early July, and then rising to a maximum in late July and early August. Seasonal and yearly trends of seeds per head agreed fairly

closely with those of numbers of bumblebees for the same periods reported earlier by Morrison (E. S. R., 89, p. 707). Number of bumblebee visitors was deemed a much more important factor in seed setting than number of honeybee visitors or number of florets per head. Aftermath crops of red clover brought into full bloom during late July or early August had a much better chance of receiving satisfactory pollination than first growth blooming earlier or aftermath crops brought into full bloom later.

Age of seed corn in relation to seed infection and yielding capacity, G. H. Dungan and B. Koehler. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 436–443, illus. 3*).—Decrease in yield from old seed corn was caused by reduction in field stand and to a lesser extent by lowered yield per plant. Three-year-old seed averaged 4.8 percent lower in yield than 1-year-old seed when both lots had perfect stands. When reduced stand also was allowed to influence yield the 3-year-old seed yielded 7.8 percent under 1-year-old seed. With high-quality seed originally, yields declined gradully, yet fair yields were obtained for 6 yr.; with corn of average commercial quality, yields from 2- and 3-year-old seed were significantly lower than yields from seed of the previous season's crop. Aging markedly reduced prevalence of viable fungi in infected seed corn. *Gibberella zeae* infection was almost completely eliminated in seed corn held over 1 yr., *Nigrospora oryzae* infection was greatly reduced, and *Diplodia zeae* was reduced about 50 percent. *Cephalosporium acremonium* and *Fusarium monoliforme* infections were reduced considerably after 3 yr., yet some traces remained up to 7 and 8 yr. of storage.

Increased yields shown in Delta by deeper application of corn fertilizer, J. Pitner (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 6, p. 8*).—Corn receiving N as ordinarily applied, 2 to 3 in. below the seed, made with N 20 lb. 32.9 bu. per acre, 40 lb. 44 bu., and 60 lb. 50.2 bu and at these rates, 8 to 10 in. below the seed, 40.5, 48.2, and 56.3 bu. respectively, compared with 29 bu. from unfertilized corn. Addition of P and K at the 40- and 60-lb. N levels did not result in yield increases over N alone.

The relation of grazing to establishment and vigor of crested wheatgrass, A. C. Hull, Jr. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 4, pp. 358–360*).—Comparative stands and growth of grass grazed and protected in the first and second growing season at Dubois, Idaho, results in other tests, and observations by stockmen in southern Idaho indicate that full stands of crested wheatgrass may be secured under grazing, although vigor of the plants is likely to be low.

Registration of improved flax varieties, II, A. C. Arny. (Univ. Minn.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 454–457*).—Additional flaxes approved for registration (E. S. R., 90, p. 332) are Crystal, a selection from Bison × 770B, and Royal, a selection from Crown. The varieties are described with performance records.

The tolerance of flax to saline conditions: Effect of sodium chloride, calcium chloride, and sodium sulfate, H. E. Hayward and W. B. Spurr. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 4, pp. 287–300, illus. 8*).—Punjab flax was grown in sand cultures (greenhouse) including a basal nutrient solution (0.5 atmosphere osmotic concentration) and three series of salt solutions adjusted to 1.5, 2.5, 3.5, and 4.5 atm. osmotic concentration by addition of NaCl, $CaCl_2$, and Na_2SO_4, respectively, to the basal solution. Vegetative responses to high osmotic concentrations indicated that flax is moderately tolerant to saline conditions. Effects on vegetative growth were of the same order at equal osmotic concentrations, but at 4.5 atm. Na_2SO_4 induced a more pronounced inhibition than the chloride salts. Reduction in height and diameter of flax stems under high salt treatments was

correlated with marked changes in differentiation of stem tissues. At high salt concentrations, cambium was less active and cells of the secondary xylem were smaller than in control plants. The number and diameter of the phloem fibers were also less in plants grown in substrates of high osmotic concentration which, compared with controls, delayed anthesis of flowers and setting of bolls from 5 to 18 days. At equal osmotic concentrations, the inhibitive effect with Na_2SO_4 was most pronounced, NaCl intermediate, and $CaCl_2$ least. Seed yield was reduced by high salt concentrations in all series, $CaCl_2$, in general, being less inhibitive. At high concentrations of salt (3.5 and 4.5 atm.) relative yields were reduced from 25 to 62 percent, and no mature seed were produced at the highest concentration of Na_2SO_4. Effects of treatment on seed quality were not significant.

Kobe, a superior lespedeza, R. McKee and H. L. Hyland (*U. S. Dept. Agr. Leaflet 240 (1944), pp. 6, illus. 4.*).—Kobe, an improved large-growing late-maturing variety of common lespedeza, *Lespedeza striata,* if grown more extensively in the South where it is adapted will help insure adequate supplies of hay and pasture for livestock and increase general crop production. Characteristics of Kobe are compared with those of Korean (*L. stipulacea*) and of common and Tennessee 76, and information is given on the adaptations, seed and its production, seeding practices, fertility needs of Kobe, and its value for pasture, hay, rotations, and soil improvement.

Registration of varieties and strains of oats, XIII, T. R. Stanton. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 445–446*).—Cedar, the oats variety approved for registration (E. S. R., 89, p. 206) and described with performance record, is an early yellow common spring oats, high in yield and quality, and resistant to nearly all physiologic races of the oats rusts and smuts. It originated from Victoria × Richland.

Potatoes: Growing, fertilizing, and storing in Alaska, D. L. Irwin (*Alaska Sta. Cir. 3 (1944), pp. 5*).—Practical recommendations, based extensively on station experiments, cover varieties, soils and soil preparation, seed and treatment, and culture, harvest, and storage methods. Red varieties adapted to Alaska include Bliss Triumph, Early Ohio, and Early Rose, and white varieties Arctic Seedling, White Bliss, White Swiss, Green Mountain, Irish Cobbler, American Wonder, and White Gold.

Good seed potatoes give best results, R. J. Haskell and R. R. Pailthorp (*U. S. Dept. Agr., 1944, AWI-88, pp. 5*).—Characteristics of good seed potatoes are described briefly, and requirements for certified and war approved seed potatoes are outlined.

Potato tuber yields, size, skin thickness, and skin color affected by minor elements, J. G. McLean, W. C. Sparks, and A. M. Binkley (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 3, pp. 14–15*).—The sulfates of Cu, Fe, Zn, and Mn were applied at rates of 25 lb. per acre separately and in all possible combinations to Red McClure potatoes grown in the San Luis Valley. Cu-Fe, Cu-Fe-Mn, Fe-Mn-Zn, and Mn alone gave definite yield increases, while Zn alone and Fe-Mn decreased the yield. Use of three or four elements in combination produced yields consistently higher than that of the control. The size of the tubers generally increased as the yield rose, and in such cases the greater size of the tubers was believed to be responsible for the increased yield. Cu-Fe and Cu-Fe-Mn treatments produced a significantly thicker periderm layer on the tubers in field and greenhouse. In the field all treatments which were below the control contained Zn. Tubers from treatments containing one element were significantly darker than those from the check, but were not as dark as those from two-element treatments; and tubers from three-element treatments were generally the darkest.

The effect of certain minor elements on yield, size, and skin thickness of potato tubers, J. G. McLean, W. C. Sparks, and A. M. Binkley. (Colo. State Col.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 362–368*).—Major findings in this research are noted in the preceding abstract. When all measurements mentioned were considered, it appeared that treatment of the soil with the Cu-Fe-Mn or Cu-Fe combinations would produce the greatest yield of U. S. No. 1 size tubers, with the thickness of the skin significantly increased over tubers from control plants.

The effect of certain minor elements on the skin color of potatoes as measured by the multiple disc colorimeter, W. C. Sparks. (Colo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 369–378, illus. 2*).—The multiple disk colorimeter described proved satisfactory in determining differences in tuber color and provided a method by which such differences could be presented for analysis. The main observations in this work are noted above.

Potato varieties in relation to blackening after cooking, G. H. Rieman, W. E. Tottingham, and J. S. McFarlane. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 1, pp. 21–31, illus. 1*).—Consistent differences in amounts of blackening after boiling were observed among 23 potato varieties and strains grown, 1937-41, in test plats on 4 soil types in 9 counties in Wisconsin. Triumph and Chippewa, the whitest-cooking varieties, showed only one-half as much blackening as Rural New Yorker and Russet Rural, the dark-cooking potatoes. Eight named varieties developed through clonal selection behaved similarly to their parental varieties. White-cooking tendencies shown by the closely related Chippewa, Katahdin, and Sebago suggest that these varieties carry genetic factors for white tuber flesh after boiling. Behavior of F_1 progenies derived from Katahdin and Sebago crossed with the dark-cooking Hindenburg supported this assumption. White tuber flesh after cooking was dominant or incompletely dominant to gray tuber flesh after cooking. Recovery of parental types among 267 F_1 individuals indicated simple factorial interactions for after-cooking blackening. Segregation in F_1 demonstrated heterozygosis in parental stocks. Since the dark-cooking character is inherited, this factor may be partially controlled by breeding potato varieties showing white tuber flesh after boiling. Climatic factors profoundly influenced the formation of substances in potato tubers which turn dark after boiling, but soil type and soil fertility had only limited influence on the blackening process. Conditioning of potatoes in storage had a marked effect on blackening.

Potato quality.—VII, Changes in potato tubers following treatments which affect blackening, O. Smith and W. C. Kelly. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 384–388*).—Further studies (E. S. R., 89, p. 210) are reported on the effects of source of tubers, storage temperatures, gas storage treatments, and treatment with ethylene chlorohydrin on pH of the tuber tissue, buffer capacities of the tubers, and degree and extent of blackening of the cooked tubers.

Experiments on shipping washed early potatoes, G. B. Ramsey, J. M. Lutz, H. O. Werner, and A. D. Edgar. (Coop. U. S. D. A. and Colo. Expt. Sta.). (*Nebraska Sta. Bul. 364 (1944), pp. 32, illus. 15*).—Experiments to determine the best means of shipping washed potatoes during warm weather were conducted in central Nebraska and northeastern Colorado during the summers of 1941 and 1942 with 43 carloads of washed Triumph, Warba, and Irish Cobbler potatoes bound for Chicago. Effects of atmospheric conditions in the field at harvest upon development of tuber defects and rotting in transit were also studied. Serious losses have resulted from improper methods of handling potatoes before and during loading, or in transit.

"Browning" of skinned portions of tubers occurred in as short exposure as 15 min. on a day not unusually bright or windy. As the temperature, wind velocity, or exposure time increased, damage to tubers was more severe so that scald or decay often developed while the damaged tubers were in transit or on the market. At temperatures of 125° to 135° F., tubers were found to discolor and break down rapidly. Promptly picking and hauling, protecting tubers from the dry atmosphere in the field by tightly woven bags, covering loaded trucks with tarpaulins, and protecting stacks of potatoes at sheds from sun and wind were found useful in preventing damage to tubers before shipping. Types of damage occurring with early potatoes shipped during hot weather in order of increasing severity are: Browning, sunken scald spot, scald, and bacterial soft rot.

In general, a transit temperature of 60° was low enough for potatoes of good quality handled carefully before and during loading. Tubers injured severely by heat or wind in the field or packing shed did not carry well at as low as 50°. When car temperatures are low upon arrival in Chicago, appearance of potatoes is very attractive but not necessarily indicative of better keeping quality after unloading. Pre-icing of cars before loading appeared economically to be the most desirable shipping method. Prompt cooling of potatoes as loaded checked development of browning and decay. Enough ice remained to maintain a desirably low temperature en route—the potatoes averaging 57° on arrival in Chicago, not too low to prevent wound healing. Comment is also made on the merits of other methods of shipping potatoes to Chicago—standard ventilation, pre-icing and re-icing to capacity en route, mechanical precooling promptly after loading, and delayed icing. A fan car (equipped with fans under floor racks and operated from car axles) provided very satisfactory precooling when the car was pre-iced and fans were operated by motors before and when the car was loaded. Stage icing of a mechanically cooled car (icing at Council Bluffs) resulted in saving in ice and an average car temperature at Chicago of 59°.

Pyramid loading was more satisfactory than aisle loading because the more equally spaced air channels permitted quicker cooling and the load carried better. With all shipping methods, highest temperatures and most decay generally occurred at the middle-layer quarter-length position where cooling was slowest and was least at the bottom-bunker layer position where cooling was rapid. Of six types of bags, burlap bags proved best, and medium-weight cotton bags second best. Weight losses in transit were greatest with coarse mesh or net bags and least with cotton sheeting, but differences were small.

Growing soybeans in California, B. A. Madson (*California Sta., [1944], pp. 4*).—Although test results during 25 yr. indicate that soybeans have little prospect of becoming an important cash crop in the State—average seed yields have not been large enough for profit—they produce with irrigation good vegetative growth in most sections and have a definite place in California agriculture as a forage (hay) and soil improvement crop. Information is given on varieties, climatic and soil requirements, culture and harvest practices, and on local pests—jackrabbits, red spider, and nematodes. Promising varieties tested are Manchu, Illini, Harbesoy, Minsoy, Scioto, Virginia, and Laredo for seed and Virginia, Laredo, and Manchu for hay.

Registration of varieties of soybeans, II, W. J. Morse. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 458–460*).—Soybean varieties approved for registration include Earlyana (E. S. R., 90, p. 334) and Patoka and Gibson (E. S. R., 88, p. 476).

Registration of sorghum varieties, IV, R. E. Karper. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, p. 453*).—Westland, selected from Wheatland and approved for registration (E. S. R., 89, p. 62), is a double dwarf

combine-type of grain sorghum with yellow seed, stalk and head resembling kafir, and resistant to *Pythium* root rot.

Atypic dwarfing in sorgo, A. M. SCHLEHUBER. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 4, pp. 361–364, illus. 2*).—Occurrence of a peculiar type of dwarfing in strains of sorgo is reported, especially in an inbred line, No. 3049-9, of Straightneck (M. N. 51). Similar dwarf types have been observed in bulk plantings of Straightneck M. N. 29, Straightneck M. N. 51, and Hodo M. N. 48. All plants were dwarfed in 2 inbred lines (out of 99 grown) of Straightneck M. N. 29. The cause of the abnormality is not known.

La determinación de algunas nuevas variedades de caña plantadas en el país [Determination of some new varieties of sugarcane planted in the Argentine Province of Tucumán], G. L. FAWCETT (*Rev. Indus. y Agr. Tucumán, 33 (1943), No. 1-3, pp. 5-10, illus. 2*).

Self-fertilization in the Russian dandelion, Taraxacum kok-saghyz, H. E. WARMKE (*Amer. Nat., 78 (1944), No. 776, pp. 285–288, illus. 1*).—Wide variability in extent of flowering and self-fertility, apparently associated with season, was evident in greenhouse cultures.

Weeping lovegrass in Oklahoma, H. W. STATEN and H. M. ELWELL. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul. 281 (1944), pp. 22, illus. 7*).—Weeping lovegrass (*Eragrostis curvula*), a bunch type perennial recently introduced from South Africa, has made excellent stands and yields in both broadcast strips and rows in different sections of Oklahoma, is also a good seed producer and easy to establish and has made a vigorous growth on a wide range of soil conditions, is excellent for erosion control purposes, and has completely controlled weeds or other undesirable competing plants on poor, eroded soil. Although the grass has an enormous root system, it is easily eradicated by cultivation. Another possible use is in a crop rotation for adding organic matter to the soil. Current results suggest that weeping lovegrass should be stocked heavily enough to keep in a green, growing condition. Hay of better quality is produced when the grass is cut in a lush growing period. Since the grass remains green well into the winter and starts growth earlier in the spring than native grasses, it may have an important pasture value at these times.

Information is included on the characteristics of the grass and cultural and harvest methods. Brief reports are also made on hay and seed yields in establishment and production tests in different localities; comparative utilization by steers of this grass, little bluestem, and native grass mixture and their Ca, P, and N contents; and the apparent digestion coefficient of weeping lovegrass compared with common hays.

Long-time wheat variety yield comparisons, H. H. LAUDE. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 2, pp. 152–161, illus. 4*).—Experimental data covering many years of tests at the experiment stations in the United States revealed that comparative yields of wheat varieties often do not continue constant during the long test periods. In some cases change in the comparative yield of varieties is gradual, and varietal differences may either increase or decrease. Such changes are assumed to be results of changes in environment, including meterological, biological, and nutritional factors, and/or the varieties. Varietal changes which may influence long-time comparisons apparently must be caused by changes in the population or by changes, possibly related to hybrid origin, within the protoplasm of the plant of one or both of the varieties.

Registration of improved wheat varieties, XVI, J. A. CLARK. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 447–452*).—Varieties approved for registration (E. S. R., 89, p. 212), with performance records, included Fairfield (E. S. R., 88, p. 762), a soft red winter wheat developed from a cross be-

tween Purkof and Fulhio, productive, and resistant to cold and winter-killing and to loose smut and mosaic; Carleton and Stewart durums (E. S. R., 89, p. 308) selected from crosses of Mindum with Vernal emmer, superior to Mindum in stem rust resistance; and Newthatch, a hard red spring wheat, produced by backcrossing in which Thatcher was the recurring and Hope the nonrecurring parent, resembling Thatcher in plant and kernel type but surpassing it in yield and leaf and stem rust resistance. It is very resistant to lodging and has excellent milling and baking qualities.

Effect of unharvested soybean residues on the yield of the succeeding wheat crop at different soil fertility levels, M. T. VITTUM and N. HORRALL. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 468–469*).—In the 4-yr. rotation of corn (rye intercrop), soybeans, wheat, and clover on Crosby silt loam, very low in fertility and organic matter, wheat on plat borders from which no soybeans had been removed made much better growth than on adjacent areas from which the beans had been removed, and wheat on the borders outyielded the corresponding plats. Increased yields on borders are explained by no soybeans, no plant food nutrients being removed from the borders, and in the month between cutting soybeans on the borders and wheat seeding, decomposition of the green material. This contained a favorable C : N ratio, thereby improving the physical condition of the soil and thus forming a better seedbed for wheat.

Seed inspection, F. A. MCLAUGHLIN (*Massachusetts Sta. Control Ser. Bul. 119 (1943), pp. 63*).—Purity, weed seed contents, and germination percentages are reported for official samples of seed of field crops and seed mixtures and germination for samples of vegetable seed collected in Massachusetts during the year ended November 1, 1943. Reports are also made on field tests for trueness to type and variety on lots of beans, beets, carrots, and corn, in conjunction with G. B. Snyder; and on germination and performance tests of flower seeds, by C. L. Thayer.

Germination studies of the seeds of some common weeds, J. N. MARTIN. (Iowa State Col.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 221–228*).—Seeds of the common weeds here discussed were periodical in germination; with some it occurred in spring, with some in late spring or early summer, and with others in the fall. Some seeds of the first group germinated in moist storage at 5° C. Except for horsenettle and blue vervain, the seeds of all species studied were found to require no special conditions for germination beyond suitable temperature and moisture; in most cases, however, it was inhibited by seed coat or fruit covering until after a short period of weathering. Various types of storage—as in constantly low, laboratory, or alternating outdoor temperature—did not as a rule affect significantly the germination, which was good after all types of storage.

The chemical control of Bermuda grass and of crowfoot grass, F. FROMM and I. M. VIDAL (*Science, 99 (1944), No. 2580, p. 478*).—Bermuda grass was controlled by ammonium sulfamate and by calcium thiocyanate, and crowfoot grass (*Eleusine indica*), if cut previously, was eradicated by calcium thiocyanate.

Poison ivy, J. G. FISKE (*New Jersey Stas. Cir. 482 (1944), pp. [4], illus. 2*).—Spraying poison ivy with ammonium sulfamate, 0.75 lb. in 1 gal. of water to about 200 sq. ft. of area, on a bright day in July or August has been successful as a control measure. Very dense growth may require a second application. Dry borax, 4 lb. to 100 sq. ft., also has been effective. Other methods include salt, dry or spray, hand grubbing or digging, and in open fields plowing and cultivation. Characteristics of the plant, its poisoning action, and treatments are described briefly.

HORTICULTURE

Some seed production problems as seen in the laboratory, C. E. Heit. (N. Y. State. Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, pp. 2, 13*).—Many stocks of fresh, sound-looking carrot seeds showed germinations of only about 55 percent. Attempts to improve such seed by severe blowing and screening were not effective. Dissection of seeds revealed that many contained poorly developed embryos or none at all, with the endosperm apparently normal. Beet seeds harvested while the seed balls were still greenish appeared sensitive to moisture conditions, both in the laboratory and in soil. The author suggests that it is not advisable to harvest beet seeds too early and that if it is necessary to do so such seeds should be carefully handled to obtain maximum germination. Slightly immature cabbage seed germinated 66–72 percent in the laboratory but very poorly in the field. It was found that if the seed was drilled into slightly moist soil and the surface not allowed to become soaked for at least 2 days good germination followed. Dill and fennell seeds which did not germinate during a period of 14 days at 20°–30° C. were of little value. Dissection of such seeds revealed that many had no embryos.

Sawdust makes an excellent mulch, R. C. Collison. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, p. 10*).—Sawdust is said to be a successful mulch for orchards, blueberries, and other fruits. The acid reaction of sawdust may be offset by adding a small quantity of lime. It may be necessary, also, to increase the amount of applied nitrogen to offset the effect of the carbonaceous material.

Irrigating the home garden, A. S. Curry (*New Mexico Sta. Bul. 313 (1944), pp. 8, illus. 7*).—General information is presented on planning the garden for irrigation, making the furrows, applying water, checking moisture needs, arrangement of the plant beds, etc.

Fertilizers for cabbage, peas, and tomatoes, E. L. Moore and J. A. Campbell (*Mississippi Sta. Bul. 397 (1944), pp. 23, illus. 8*).—Of the three principal fertilizers—nitrogen, phosphorus, and potash—nitrogen was the most important with cabbage, the yields and profits increasing with increases in the amounts applied. Increasing the amount of P up to 12 percent also increased the yields and profits from cabbage. K had the least influence of the three elements. Studies with peas gave somewhat the same results, i.e., N and P were the most important and K beyond a limited amount had little influence on yield. In the case of the tomato, it was evident that all three nutrients are needed in large quantities. Large applications of N did not tend to increase the percentage of cull tomatoes or affect seriously the storage quality. Studies of the residual effects of fertilizer under cabbage, peas, and tomatoes upon subsequent corn yields showed N to be the most important element. However, the yield of corn following tomatoes was not sufficient to pay for the cost of producing the crop. Practical suggestions for formulas and amounts and methods of application are presented for all three crops.

The response of some muck crops to the application of minor elements, D. Comin (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 144–147*).—The value of certain amendments such as copper sulfate, manganese sulfate, and a proprietary material containing sulfates of manganese, copper, zinc, and iron was tested on muck soil of pH 5.5–5.8 and in a good state of fertility. Small but consistent increases in yields of vegetables were obtained from all treatments. As a result of these preliminary trials the author concludes that table beets should, under comparable conditions, receive 50 lb. or more per acre of both copper and manganese sulfate. The results with other crops were not so conclusive.

Growing beans and peas in New Jersey home vegetable gardens, V. A. Tiedjens, L. G. Schermerhorn, P. P. Pirone, and B. B. Pepper (*New Jersey*

Stas. Cir. 480 (1944), pp. [4]).—Simple and useful information is offered on types and varieties, general culture, insect and disease control, seed inoculation, etc.

Growing leafy vegetables in New Jersey home gardens, V. A. TIEDJENS, L. G. SCHERMERHORN, P. P. PIRONE, and B. B. PEPPER (*New Jersey Stas. Cir. 478 (1944), pp. [6]*).—Information is offered on the growing of Italian broccoli, cabbage, cauliflower, lettuce, New Zealand spinach, spinach, Swiss chard, and other leafy types of vegetables.

Growing root crops in the home vegetable garden, V. A. TIEDJENS, L. G. SCHERMERHORN, P. P. PIRONE, and B. B. PEPPER (*New Jersey Stas. Cir. 479 (1944), pp. [4]*).—Concise practical suggestions are offered on the growing of beets, carrots, onions, potatoes, rutabagas, sweetpotatoes, turnips, and other root crops.

Growing carrots on muck soil, D. COMIN (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 147–153*).—Experiments at the Muck Crops Experiment Farm near McGuffey showed that K is the most important single element for carrots. In fact, materials containing phosphoric acid and K without N are recommended for mucks of the character used. Information is given on the preparation of the soil and on planting methods. Descriptions are presented on a number of varieties. As to water requirements, the best results were obtained when the water table was held at from 24 to 36 in. below the soil surface. Irrigation trials indicated the value of supplemental water during periods of extended drought with only slight to moderate benefits in seasons of average rainfall. Some facts are presented on labor requirements, costs, and returns.

Disease resistance in New York hops urgently needed, R. O. MAGIE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, pp. 5, 6, illus. 1*).—Downy mildew, a relatively new disease of the hops, is capable of destroying the entire crop in rainy seasons. Control by fungicides is costly, making resistant varieties highly desirable. A total of 39 kinds of hops collected all over the world were tested at Waterville, N. Y. Of the four main varieties grown in New York, Brewer Gold is highly resistant to downy mildew, but, unfortunately, only about 3 percent of the present acreage is of this kind. The technic for developing new varieties of hops is described.

The Purdue 44 muskmelon, J. D. HARTMAN and F. C. GAYLORD (*Indiana Sta. Cir. 295 (1944), pp. 8, illus 5*).—An account is presented of the origin, plant and fruit characteristics, productive capacity, and general usefulness of a new variety of muskmelon. The new melon possesses resistance to *Alternaria* leaf spot, one of the most destructive diseases of the muskmelon in southern Indiana. On the other hand, the new variety is not resistant to bacterial wilt. The fruit is of the Hale Best type and in edible quality is at least equal to other Hale Best varieties. Purdue 44 is considered particularly well adapted to the sandy soils of southwestern Indiana.

A rapid method for finding the volume and density of muskmelon fruits, T. M. CURRENCE, R. E. LAWSON, and R. M. BROWN. (Minn. Expt. Sta. coop. Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 68 (1944), No. 12, pp. 427–440, illus. 9*).—Density of muskmelon fruits indicates size of the seed cavity and is frequently needed in making comparisons of varieties, cultural treatments, breeding methods, and other studies. By comparing the shape and volume of 426 muskmelon fruits with the shape and volume of an ellipsoid and sphere it was possible to derive adaptations of the volume formulas of the geometrical solid for muskmelons of different shapes. The formula derived is volume $= KD^2L$. K is variable with different shape classes and is substituted for the constant, 0.5236, in the ellipsoid volume formula $0.5236\ D^2L$. An alinement chart as well as a slide rule adaptation simplify use of the formula if many fruits are to be tested.

Growing tomatoes in New Jersey home gardens, V. A. Tiedjens, L. G. Schermerhorn, P. P. Pirone, B. B. Pepper, and C. M. Haenseler (*New Jersey Stas. Cir. 481 (1944), pp. [8], illus. 5*).—General information is presented on varieties, plant production, culture, pruning and training, controlling of insect and disease pests, etc.

Ripe tomatoes and defoliation. J. I. Shafer, Jr. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, pp. 1, 2*).—Defoliation causes losses to tomato growers in New York State by reducing yields and the quality of the fruit. To determine whether the presence of ripe tomatoes in the field had any effect on defoliation, several methods of harvesting were compared. However, even when the cull tomatoes were left to rot in the field, there was no measurable effect on defoliation. Spraying the vines with copper oxychloride sulfate reduced defoliation greatly but also reduced yields below those of the unsprayed plants.

Home orchards in Mississippi, T. H. Jones and T. E. Ashley (*Mississippi Sta. Bul. 393 (1943), pp. 38, illus. 27*).—This revision of an earlier bulletin (E. S. R., 84, p. 760) presents general information on the planning, planting, and care of the home orchard. Included are instructions on pruning and training various orchard trees, grapes, and bush fruits; soil management and fertilization; control of pests; fruit thinning; selection of varieties; etc.

Propagation of apple and quince by layering, F. B. Lincoln (*Maryland Sta. Bul. A28 (1943), pp. 53–66+, illus. 11*).—General information is presented on the principles and detailed practices of propagating fruit trees by the process known as layering, in which stems or other above-ground portions of a plant are covered with soil or other materials and thereby induced to form roots. Special attention is given to the procedures of trench layering in which the young tree is pegged down horizontally in a small trench and covered shallowly with soil. The care of the rooted plants after severance from the mother plant is outlined.

Experiments show benefits of fertilizers in peach orchards, A. L. Stark (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 2, pp. 4, 11*).—Declining yields, attributed to clean cultivation, led to a series of experiments with various cover crops and fertilizers. Trees receiving P alone produced fruit of a much higher color than did trees receiving N alone or N plus P. Trees receiving N alone were from 10 to 14 days later in maturing their fruits than were the P-treated trees. However, on the basis of yield, growth, and vigor, a combination of N and P is indicated. Barnyard manure is valuable but may be replaced by cover crops and fertilizer.

Effects of fall application of nitrogen fertilizer on the soluble nitrogen and phosphate phosphorus content of dormant peach twigs, C. S. Waltman (*Kentucky Sta. Bul. 457 (1944), pp. 16, illus. 8*).—Southhaven peach trees were fertilized in October 1940 with different nitrogen materials—calcium cyanamide, sulfate of ammonia, and nitrate of soda. Twigs were collected at 2-week intervals beginning some time before the fertilizer applications and continued thereafter until the succeeding April. In trees fertilized with calcium cyanamide there was a net decrease in the proportion of soluble N compared with the check trees, the reduction being almost directly proportional to the amount of fertilizer applied. Net gain in soluble N was greatest in the trees fertilized with 4 lb. of either ammonium sulfate or nitrate of soda, and this gain was approximately twice that in twigs of trees receiving 2 lb. of the same materials. Supplied equal amounts, there was somewhat more soluble N in the ammonium sulfate than in the nitrate of soda treated trees. Phosphate P was always lower and varied generally less than soluble N in the twigs. There was a small net increase of phosphate P in the calcium cyanamide trees over that of the other two treated groups. There was a general de-

cline in the percentages of soluble N and phosphate P in the twigs during the winter in all treatments. Despite the significant differences in percentage of soluble N in trees of various treatments, there were no significant differences in the phosphate P content of the twigs or in the fruit yields from the different treatments.

Influence of trunk injuries on the potash content of fruit tree leaves, N. L. PARTRIDGE (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 265–267*).—An appearance of potash injury was noted in peach trees with severe trunk damage caused by borers, mice, frost, cankers, insects, and other destructive agents. Leaves collected from these trees were found to be lower in potash than those taken from nearby undamaged trees. The leaves of trees injured by poor soil drainage were particularly low in potash. Comparable differences in potash content were observed between injured and normal cherry trees. Applications of potash to the soil did not offset the deficiencies caused by injury. Hence leaf determinations for fertility needs should be confined to healthy uninjured trees.

The identification of plum varieties from non-bearing trees, L. SOUTHWICK and A. P. FRENCH (*Massachusetts Sta. Bul. 413 (1944), pp. 51, illus. 23*).—This bulletin discusses the characteristics of growth, bark, and foliage by which nursery plum trees may be identified and presents discussions and photographs of 57 varieties. Among useful characteristics in identifying varieties are habit of growth, color of bark and of young shoots, surface character of twig, shoot pubescence, petioles and glands of the leaves, and shape, color, and margin of the leaves.

The effect of straw mulch, cultivation, and nitrogen fertilizer on the growth and yield of Latham raspberries, W. P. JUDKINS (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 154–158, illus. 2*).—Nitrogen increased the yield of Latham raspberries grown under cultivation and cover crops or mulch on Wooster silt loam. A spring application of 200–300 lb. of ammonium sulfate, or its equivalent, may be expected to give profitable increases in yield on well-drained soils of moderate fertility. Straw mulch is considered the most worthy cultural treatment, resulting in higher yields, decreased erosion, control of weeds, vigorous growth, less heaving in winter, greater soil moisture, and lower soil temperature in summer.

Red raspberry varieties for freezing, local market, and home use, F. M. COE (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 2, pp. 3, 11, illus. 1*).—Information is presented on a number of red raspberry varieties and seedlings. Among promising new kinds are Taylor and Newburgh, productions of the New York State Station.

Effects of soil treatments on the growth of the highbush blueberry, T. A. MERRILL. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 1, pp. 9–20, illus. 6*).—Two types of soil, namely, muck or peat and sandy muck, or sand, containing a rather high percentage of organic matter are suitable for blueberry culture. There is considerable variation in the type of growth of blueberries occurring on each of these types of soil. Field and pot experiments with both types of soil indicated that the blueberry plant is very sensitive to differences in soil acidity when the lower limits of tolerance are approached. Hence, when plants are not growing vigorously, attention should be given to the soil reaction. In the soil under test, a pH of 3.2 was below the limit of vigorous growth for blueberries. Symptoms associated with too great acidity are leaf scorch, which begins at the margins and progresses across the leaf, resulting in its death. This may be followed by stunting and, finally, by death of the affected plants. Applications of lime sufficient to raise the pH of the soil from 3.4 to 3.8 prevented leaf scorch and resulted in normal growth. A positive correlation was found between total growth of plants and total milligrams of nitrogen and phosphorus in the tops of the plants grown in sand and between total growth and the nitrogen and potash

content of plants grown in muck. Muriate of potash should be omitted from the complete fertilizer mixture.

Pruning the highbush blueberry, W. T. Brightwell and S. Johnston (*Michigan Sta. Tech. Bul. 192 (1944), pp. 24, illus. 12*).—Rubel and Pioneer blueberry plants set in the field in 1929 were subjected to different pruning treatments during the seasons of 1939 to 1942. The plants had been moderately pruned in the intervening years and fertilized annually. Clean culture was practiced each year until harvest. Conditions in general favored the production of large crops of berries. The unpruned plants averaged larger yields for the 4-yr. period than did the pruned. In fact, average yields decreased with the severity of the pruning. On the other hand, the average size of berries of both varieties increased with the severity of pruning. The size of berrries increased also as the diameter of the laterals increased from $\frac{1}{32}$ to $\frac{7}{32}$ in. Berries ripened earlier on large laterals than on small laterals. Pruning tended to result in a larger percentage of the crop maturing in the early part of the season. The unpruned plants netted larger gross returns than those which received an annual pruning, and the returns decreased in order of the severity of the pruning.

Fertilizing commercial blueberry fields in New Jersey, C. A. Doehlert (*New Jersey Stas. Cir. 483 (1944), pp. 8, illus. 1*).—Information is presented on materials, amounts to use, methods of applications, and the effects on growth and yield.

Naranjillas, the golden fruit of the Andes, M. E. R. Chalons (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 6, pp. 110–112, illus. 4*).—Information of a general nature is presented on the growth and fruiting habits, cultural requirements, and utilization of the subtropical plant *Solanum quitensis* which, because of poor shipping quality and handling methods, is now consumed entirely in Ecuador, the country where it is produced.

Culture studies of the drug plant Atropa belladonna, W. R. Brewer and A. Laurie (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 159–167*).—Studies on the culture of belladonna, undertaken as a wartime project, indicated that germination could be increased by immersing seeds for from 60 to 100 sec. in commercial sulfuric acid, followed by soaking in water for 24 hr. A temperature of 90° F. for 1 week, followed by 60°, was indicated as desirable in the seed beds. Belladonna yields were increased by high N, with low levels of P and K being satisfactory. A pH of 5.5 to 5.6 was optimum. The treatment of belladonna seedlings with colchicine showed no consistent effects on the alkaloid content and did decrease the yield of plant material. The highest assays of alkaloids were obtained in plants harvested in bloom. Alkaloids were greatest in the immature foliage. Heavy mulch favored overwinter survival as did the withholding of late applications of N.

Pyrethrum cultivation in Kenya, R. S. Ball (*Nyasaland Agr. Quart. Jour., 4 (1944), No. 1, pp. 7-18*).

In quest of quinine, C. L. Horn (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 7, pp. 130–133, 136, illus. 5*).—A brief account is presented of a journey across the Andes Mountains of Bolivia to study cinchona plantings established for quinine production.

Yam bean, warm-climate plant, is a possible new insecticide, R. T. Clausen. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, p. 14, illus. 1*).—The great shortage in rotenone due to the Japanese invasion of the East Indies created an intense interest in other sources of this valuable insecticide. Field studies in Central America revealed at least six species of yam beans, distinct in foliage, flowers, fruits, and seeds. For insecticidal purposes, the common yam bean *Pachyrhizus erosus* appears most promising, with considerable difference in the rotenone content of different strains.

The outlook for agricultural veneer containers in southern Michigan—1944, R. C. Johnson (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 363–371, illus. 1*).—In face of a critical shortage of containers for fruits and vegetables, a study is made of available supplies, requirements, and ways and means of meeting the situation. In the fruit belts near Detroit and Chicago there were many used containers available, but not enough to handle the crops. Nine veneer mills are operating in Michigan, but only four of these are working at more than 50 percent of capacity. Labor shortage is by far the most serious problem, and the low prevailing wage scales prevent successful competition in the labor market. Constructive suggestions for remedying the situation are offered.

FORESTRY

Forest management for the eastern part of the Upper Peninsula of Michigan, M. W. Day (*Michigan Sta. Cir. 190 (1944), pp. 22, illus. 2*).—The accumulated experience from the actual management of the Dunbar Forest Experiment Station and from records on research plats were used as a basis for preparing this circular. Included are descriptions of the forest types present, discussions of the objectives of forest management, forest cultural practices, harvesting operations, forest protection, reforestation, and methods for handling the several forest types which are designated as northern hardwood, spruce-fir, pine, aspen, and cedar and spruce swamp.

Experiments in rooting pines in California, N. T. Mirov. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry, 42 (1944), No. 3, pp. 199–204*).—The propagation of pine by cuttings is conceded to be in a highly experimental stage. There is evidence in favor of using material from young trees, but the value of root-promoting substances is less certain. The results with ponderosa pine showed no consistent benefit from placing cuttings in warm water for 2 hr. before setting them in the propagation bed. Treatments with indolebutyric acid gave fair results in the case of cuttings treated with 200 p.p.m. before placement in a mixture of sand and peat.

In another experiment with ponderosa pine the results were inconclusive so far as the effects of indolebutyric acid were concerned. Spring planting of softwood cuttings proved a complete failure, probably because of unfavorable temperatures and relative humidity in the greenhouse. Experiments with other species showed that cuttings taken from 1- to 2-year-old plants rooted very readily.

Financial aspects of selective cutting in the management of second-growth pine-hardwood forests west of the Mississippi River, R. R. Reynolds, W. E. Bond, and B. P. Kirkland (*U. S. Dept. Agr., Tech. Bul. 861 (1944), pp. 118+, illus. 21*).—This paper presents the results of a study of some of the economic aspects of timber management in the shortleaf pine-loblolly pine-hardwood type west of the Mississippi River. These forests are typically young second-growth, with very little old-growth timber and not much second growth large enough for good sawlogs. Practically all the stands are understocked. There were two major objectives, (1) to test on a commercial logging operation the financial feasibility of light cuts under the selective method and (2) to show owners how to apply the results of the study in managing second-growth forests so as to maintain sustained production. The bulletin is presented in four parts: (1) Selective cutting and forest problems involved in management for sustained yield, (2) economic feasibility of light cutting, (3) individual log and tree values—economic basis of tree selection and current forest income, and (4) application of results of cutting studies to forest management.

In general conclusion, the results of the studies indicate that the great areas of pine-hardwoods involved present a vast opportunity for enterprising management.

Successful management requires not only production of an increasing flow of forest products year by year but also production during the next 20 to 30 yr. of at least enough additional wood growth to double the present volume of standing timber. Despite present demands, cuttings should be conducted in a manner that will leave to the post-war period improved forest stands rather than forest ruins.

Volunteers in forest plantings, R. R. PATON (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 175–182, illus. 4*).—Although many old fields in Ohio are restocking naturally with desirable trees, there are areas where the absence of seed, or other causes, are preventing reforestation. Planting is necessary on such barren areas. A survey of established plantations in Ohio showed volunteer seedlings in 76 percent of the locations. Grazing tended to limit volunteer reproduction. The species of volunteers depends on the kind of mother trees nearby. Wind, birds, and rodents were the most important agents of destruction. Plantings are necessary in the absence of seed trees under erosion conditions and where natural reforestation is limited. Sometimes plantings are necessary to improve the character of the stand.

Geographic source of loblolly pine seed, P. C. WAKELEY. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 1, pp. 23–32, illus. 1*).—Measurements taken 15 yr. after planting on loblolly pine trees grown in Louisiana from seed obtained from four locations, namely, Louisiana, Texas, Georgia, and Arkansas, showed marked differences in growth due to origin. The Louisiana stock averaged 32.1 ft. in height and 14.2 cords per acre as compared with 26.1 ft. in height and 6.5 cords per acre for the Georgia stock, which showed the greatest contrast. Survival did not differ greatly, ranging from 84.6 percent for Louisiana to 89.3 for Arkansas stock. The trees grown from Georgia seed were much more heavily infected with *Cronartium,* both on the trunks alone and on the trunks and limbs, than were any of the other three lots. In general, the study showed the value of using locally grown seed when such may be obtained.

Some observations on the vegetative propagation of honey locust, V. T. STOUTEMYER, F. L. O'ROURKE, and W. W. STEINER. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 1, pp. 32–36, illus. 3*).—The honey locust, *Gleditsia triacanthos,* includes desirable clones requiring vegetative propagation. Grafting and budding are expensive, and young plants obtained by such methods tend to sucker badly. The use of root cuttings was apparently the most promising method, and such cuttings may be obtained readily when pruning the roots of young trees at planting. Treatment of the base of the root cuttings with growth-promoting substances, particularly a combination of a naphthalene and an indole material, was beneficial. Cuttings from young trees rooted much more readily than those from older trees.

Southwestern oak trees, E. S. BLISS. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 1, pp. 55–57, illus. 1*).—Of the six or seven kinds of oak growing in the Southwest, only two species, Arizona white and Emory oak, are common over large areas. Both species are found usually at elevations from 4,500 to 6,500 ft., where the annual rainfall averages 20–22 in. Arizona white oak may attain a height of 60 ft. and a diameter of 30 in., while the Emory oak reaches 50 ft. and 22 in. in diameter. Measurements in established plats showed both species to grow slowly, with no great difference between young and old trees. Both species coppice freely.

Copey oak in Costa Rica, W. A. DAYTON (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 7, pp. 134–135, illus. 2*).—A brief account is given of a newly discovered oak species, the trees of which attain magnificent proportions, some being 8 ft. in diameter, with 80 ft. of clear trunk to the lower limbs.

The rigid diameter tape rule, J. B. GRAVES (*Jour. Forestry, 42 (1944), No. 3, pp. 190–191, illus. 1*).—The graduation and use of a rigid tape rule for measuring tree diameters are discussed, together with comments on the application of the principle to tree calipers, the carpenter's square, and stick rules.

DISEASES OF PLANTS

The Plant Disease Reporter, [May 15 and 22, 1944] (*U. S. Dept. Agr., Plant Disease Rptr., 28 (1944), Nos. 13, pp. 437–466, illus. 2; 14, pp. 467–494, illus. 3*).—The following are included:

No. 13.—Late blight and other diseases of potato in Southern States (S. C., Fla., Miss.); potato storage diseases in Wisconsin, by E. E. Honey; reports on diseases of greenhouse crops (Mass., Va.); vegetable diseases in California, by H. L. Barnett; other reports on vegetable diseases, including bean diseases in South Carolina, an unusual freezing injury to cabbage plants in Virginia, and onion downy mildew in New York; reports on tobacco diseases in Connecticut and Kentucky, cotton diseases in Mississippi, and downy mildew on sugar beets in California; diseases reported on cereals and grasses (Pa., S. C., Miss., Mo., Tex., Kans., Nebr., Calif.); survival of alfalfa and clovers in Minnesota, by I. W. Tervet; alfalfa diseases in Pennsylvania and diseases of various legumes in Mississippi; reports on scab and other diseases of apple in Ohio, peach diseases in Ohio and Missouri, hail injury to stone fruit trees and peach diseases in California, rust and mosaic on raspberries in Ohio, and strawberry diseases in Tennessee and Ohio; and brief notes on *Exobasidium* galls on *Camellia* spp., diseases observed during April on various plants in Texas, *Sorosphaera* on *Veronica* in South Carolina, and color preservation during the drying of fleshy green plant parts.

No. 14.—Survey of the microflora of barley seed from Minnesota, North Dakota, and South Dakota (including maps and tabulated data), by I. W. Tervet; diseases of small grains observed in Missouri, by T. W. Bretz; diseases on small grains in Minnesota and North Dakota, by I. W. Tervet; wheat disease survey in Kansas, by S. M. Pady; shorter reports on diseases of cereals (Ohio, Tex.); reports on diseases of forage legumes and grasses (N. Dak., Minn., Okla., Idaho, Oreg.); diseases reported on cotton (Miss., Tex., Okla.) and tobacco (Va., Tenn.); nematode survey in Georgia, by A. L. Taylor; diseases reported on potato (R. I., La., Tex., Okla.), tomato (La., Tex.), and on eggplant and pepper (Fla.); reports on disease and injury on garden beets (Okla., Oreg.), viruslike troubles of cruciferous seed plants (Idaho), and diseases of beans and broadbean (La.), crucifers (Fla., Okla., Idaho, Oreg.), carrots (Tex.), cucurbits (La.), lettuce (N. Y.), okra (Tex.), onions (Mass., Okla., Oreg.), cotton (Tex.), peas (N. Y., Oreg.), spinach (Fla., Okla., Oreg.), and of sweetpotatoes (Okla.); and reports on diseases of apples (Okla., Ohio), pears (Okla.), peaches (Okla., Ohio), plums (Okla.), bramble fruits (Okla.), and strawberries and grapes (Tex.).

Plant disease surveys in the southeastern United States in 1943 (*U. S. Dept. Agr., Plant Disease Rptr., 1944, Sup. 148, pp. 232–302+, illus. 2*).—These emergency surveys comprise detailed reports on diseases of various crop plants for the States of Virginia and West Virginia, by C. F. Taylor; Kentucky and Tennessee, by R. A. Hyre; Georgia and Florida, by G. M. Stone; Alabama, by Stone and J. L. Seal; Mississippi and Louisiana, by L. H. Person; Arkansas, by H. W. Larsh; and Missouri, by T. W. Bretz. Special reports are also included on tobacco diseases in Kentucky (1943), by W. D. Valleau and E. M. Johnson; and on diseases of soybeans and peanuts in the Carolinas, by R. E. Atkinson. See also (E. S. R., 91, p. 421).

Genera of the plant viruses, H. H. McKinney. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 5, pp. 139–154*).—The number of virus entities known to infect plants is now well over 200; some take the view that their classification should await the results of the chemists whereas others reason that unnecessary confusion—even with so small a number—would result from such a policy. The author believed that a system could be evolved that would meet the requirements

of the pathologists even after the chemists had devised a satisfactory system. The literature of virus classification and of general procedures is reviewed (43 references) prior to the presentation of the scheme here proposed and in which the 10 families of Holmes (E. S. R., 82, p. 632) are consolidated into two. According to the new system, all mosaic-inducing viruses and most of those causing necrosis of parenchymatous tissue fall into the Marmoraceae, and all those characterized by their marked tendency to induce malformations but not mosaic mottling, those inducing the yellows type of chlorosis, and nearly all those known to cause phloem necrosis fall into Rugaceae. Definitions of terms and detailed methods of procedure and suggestions are given before presentation of the new scheme, which includes keys to the genera of each family and detailed descriptions of the type species.

Preliminary studies of the plant viruses of Trinidad, W. T. DALE (*Trop. Agr. [Trinidad], 20 (1943), No. 12, pp. 228–235*).

Phycomycetes occurring in Great Britain.—I, Pythium mamillatum Meurs. II, Pythium anandrum Drechsler. III, Pythium aphanidermatum (Edson) Fitzpatrick, C. J. HICKMAN (*Brit. Mycol. Soc. Trans., 27 (1944), pt. 1-2, pp. 49–51, illus. 1; pp. 52–54, illus. 1; pp. 63–67, illus. 2*).—In these three brief contributions, the author presents studies, respectively, of *P. mamillatum* isolated from a root rot of *Viola, P. anandrum* from strawberry roots, and of *P. aphanidermatum* from infected stem bases of greenhouse cucumbers.

Parasitic fungi on imported straw [trans. title], G. MINZ (*Hassadeh, 24 (1943), (1943), No. 1, p. 36; Hebrew text*).—The following fungi were found on straw imported as packing material for laboratory glassware from the United States: *Urocystis tritici, Ustilago avenae,* and *Puccinia graminis tritici* and *avenae. Urocystis* has never been found on cereals in Palestine, and the other fungi may represent strains new to this country.

Some factors influencing the solubility of cuprous oxide in relation to its toxicity as a fungicide, E. A. MARTEN and J. G. LEACH. (W. Va. Expt. Sta.). (*Phytopathology, 34 (1944), No. 5, pp. 459–470*).—Growth of *Pythium debaryanum* in a standard liquid medium was inhibited by cuprous oxide at 0.3–0.5 p. p. m. of Cu in solution; as much as 0.6–0.8 p. p. m. was brought into solution by prolonged action of doubly distilled water, and ordinary laboratory distilled water dissolved 1–2 p. p. m. The solubility of cuprous oxide was greatly increased by glycine and other nitrogenous products of protein decomposition; as much as 2,200 p. p. m. was liberated by adding 1 percent glycine. The Cu liberated by these nitrogenous compounds was equally as toxic as that dissolved in distilled water provided no excess of nitrogenous compounds was present. The threshhold of toxicity in parts per million, however, was greatly increased under an excess of these compounds, 1 percent glycine raising it from 0.3 to 225 p. p. m. Soybean flour increased the solubility of cuprous oxide, a 1-percent suspension dissolving 125 p. p. m.; the Cu dissolved by it inhibited growth of *P. debaryanum* when diluted to 0.6 p. p. m., but when 0.1 percent of soybean meal was added to the diluted solution the threshold of toxicity was increased to 2–3 p. p. m. and toxicity was completely lost by adding 1 percent soybean flour. Because nitrogenous products of bacterial decomposition are known to occur in varying amounts in arable soils, it is believed very probable that they influence the solubility of cuprous oxide used as a seed protectant and may account for some of the variability in seed protection and seed injury experienced with cuprous oxide. Since the influence of nitrogenous compounds on the toxicity of Cu fungicides depends not only on the nature of the compound but also on the ratio between the two substances, caution must be used in evaluating supplements containing proteins; excess protein supplements may decrease the toxicity, whereas by increasing the solubility of Cu compounds smaller amounts may enhance their fungicidal value.

An experiment in combating rust by sulfur dusting [trans. title] G. Minz (*Hassadeh, 24 (1944), No. 5, pp. 183–185, illus. 1; Hebrew text*).—Wheat and oats were dusted with superfine Gaza sulfur. Florence wheat of Morocco origin was dusted five times (Mar. 31–May 2, 1943) after the appearance of *Puccinia graminis*. The increase in yield from sulfuring was 53 percent, and the weight of 1,000 seeds was 42.6 gm. in the dusted as compared with 27 gm. in the diseased wheat. Dusting of Mulga oats against *P. coronifera* at 7–9-day intervals failed to give a statistically significant increase in yield. The wheat rusts are more readily controlled because they appear later and their developmental period is short, so that dusting at the critical time prevents attack by the rust fungus. In this experiment relatively large amounts of sulfur were applied to insure thorough control.

Seedling invasion of the covered smut of oats, P. F. Brandwein (*Phytopathology, 34 (1944), No. 5, pp. 481–484, illus. 1*).—Extensive penetration by promycelia arising from chlamydospores of *Ustilago levis* is reported and illustrated; mycelial fusions were not apparent in these cases and no evidence is available as to whether the dikaryophase arises from such direct penetration. Furthermore there is no present way of knowing that these promycelia produce sporulating infection, but it is true that these direct penetrations appear to be more numerous than might be expected and the problem deserves further study. It may be stated that under the environal conditions encountered, penetration by the promycelium directly from the chlamydospore of race 7, without promycelial fusions, was more extensive that had been supposed. It is suggested that the developmental story of the oats smut chlamydospore on the coleoptile may differ in certain important respects from that in culture.

The black point disease of wheat, W. E. Brentzel (*North Dakota Sta. Bul. 330 (1944), pp. 14, illus. 2*).—The disease generally known as black point and shown to affect several wheat varieties proved most severe in red durum, quite severe in amber durums such as Mindum and Kubanka, and least so in the hard wheats Rival, Pilot, and Thatcher. During 1938–43 the principal pathogens responsible in North Dakota were *Helminthosporium sativum* and *Alternaria* spp., with the latter causing the larger part of the discoloration. Individual seeds infected with *Alternaria* were consistently heavier than noninfected seeds and their germination was not impaired. Planting seed infected with *Alternaria* either alone or in close proximity to other seed caused no noticeable disease development and no reduction in stands or grain yields. Planting seed infected with *H. sativum* gave considerable impairment of stand and grain yield in 1943, with a good deal of rot developing in the seed; 1942 was the only year in which this fungus appeared as a seed-borne infection to any great extent. The amount of *Alternaria* infections, particularly on the chaff and seed, was apparently not influenced by infection or lack of infection of the seed from which the plants arose. Disinfection of seed having *Alternaria* black point gave variable results but no consistent increases in yield; treatment of seed having considerable *Helminthosporium* black point (1943) gave a significant increase in yield.

Control of stinking smut of wheat, W. F. Crosier. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, p. 8*).—It is suggested that present supplies and prices justify the chemical treatment of all seed wheat, and attention is called to several effective and inexpensive materials now available for the purpose.

Physiological cotton wilt in the Sudan Gezira, A. S. Boughey (*Ann Appl. Biol., 31 (1944), No. 1, pp. 12–18, illus. 10*).—This type of wilt appears to have been present in the Gezira area of the Anglo-Egyptian Sudan since 1924 if not before. The present study indicated that between mid-October and mid-December

three factors occur which cause water stress in the crop. At some time during this period there is a marked reduction in the size of the absorbing system of the plant, correlated with maximum boll development; greatly increased day temperatures and higher evaporation prevail, while during the whole period available water in the soil declines. The theory is advanced that when all these factors occur simultaneoulsy at their maximum intensity, permanent wilting and death of the plants result; at lesser intensities, wilting is followed by recovery but with reduced yield. Confirmatory results were experimentally obtained.

Some root rots and a foot rot of lupines in the southeastern part of the United States, J. L. Weimer. (U. S. D. A. coop. Ga. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *68* (*1944*), *No. 12, pp. 441–457, illus. 8*).—Root rots of the introduced *Lupinus angustifolius, L. luteus,* and *L. albus* caused by *Fusarium* spp., *Rhizoctonia solani,* and *Pythium graminicolum,* and a foot rot caused by *Sclerotium rolfsii* are described and illustrated. *F. oxysporum* f. *radicis-lupini* n. f., the pathogen most frequently isolated, is believed to be the common cause of the root rotting of lupines found in the southeastern United States. *F. solani* f. *pisi, F. solani* f. *lupini* n. f., and *F. moniliforme* were also shown to be pathogenic under the experimental conditions involved. There are 19 references.

Leaf spot control for increased peanut yields, N. C. Woodroof, J. R. Cole, and J. H. Hunter. (Coop. Ga. Coastal Plain Expt. Sta., U. S. D. A., et al.). (*Georgia Sta. Cir. 145* (*1944*), *pp. 11, illus. 4*).—Cooperative experiments over a 7-yr. period have shown profitable yield increases from control of leaf spot due to *Cercospora arachidicola;* the results of the experimental plat tests have also been verified under farm conditions. Left to itself, this fungus causes severe spotting and premature shedding of leaves and consequent reductions. Either dusting with sulfur or spraying with bordeaux has been found satisfactory; the advantages or disadvantages of either method are said to depend to a large extent on the equipment available for application.

Studies in seed potato treatments, III, IV, L. E. Gilmore and C. H. Robinson (*Sci. Agr., 24* (*1944*), *No. 8, pp. 351–357; pp. 358–365*).

III. *Agencies and practices that reduce the strength of mercuric chloride solutions, causing ineffective disinfection.*—Preceding installments have concerned laboratory and field methods (E. S. R., 89, p. 688). The loss of $MgCl_2$ during seed tuber disinfection is here attributed possibly to both chemical reduction and physical adsorption; the actual losses effected in 1.5 hr. from 5 l. of 1–1,000 solution were 15–45 percent by dirty used sacks, 6–28 by washed sacks, 11–30 by 1 lb. of soils, 3–11 by washed potatoes, and 0.5–3.8 percent by wooden vessels. Tubers had a negligible reducing effect if the cut tubers were discarded for seed treatment. Any potable well water is said to be suitable for preparing the solutions. Repeated use of the original solution for effective disinfection by the standard long-soak process is possible through maintenance of strength by removal of as much soil and refuse as possible, preferably by soaking the tubers in water for 3 hr. or more; use of concrete, porcelain, or wooden vessels free from metal contacts with the solution; discontinuance of use of sacks and other potato containers; and testing and adjusting the strength of $HgCl_2$ before each successive treatment by methods described.

IV. *The repeated use of corrosive sublimate solutions by strength-control and by acidulation with acetic acid for effective disinfection practice.*—In treating washed potatoes for 90 min. in 1–1,000 $HgCl_2$ solution, it was found possible to control the strength in successive lots by the authors' method of testing and adjusting; 9 successive lots were treated with the original solution, the loss of $HgCl_2$ averaging less than 6 percent per treatment. The alternative acidulated treatment offers some advantages in meeting the popular demand, acetic acid preventing the rapid depletion of $HgCl_2$ occurring in nonacidulated solutions. Without adjust-

ment of any kind, 20 successive lots of unwashed tubers were treated in a wooden vessel containing 2 gm. $HgCl_2$ and 16.7 cc. glacial acetic acid per liter; at the end of the test, a total of less than 10 percent $HgCl_2$ and 5 percent acetic acid had been lost. The advantages of this method over the other are that 20 treatments without adjustment may be made, 10 min. instead of 90 are required, the tubers need not be washed, acetic acid as used is noninjurious to tubers, skin, or clothing, and a considerable saving in labor and material costs is possible. With either method, sacks, crates or hampers, and as much soil and refuse as possible, should be kept out of the disinfecting solutions.

The soil as a source of infection of dry rot of potato, T. SMALL (*Nature [London], 153 (1944), No. 3884, pp. 436–437*).—Results presented for the experimental locality (Cheshire) establish the fact that the fungus *Fusarium caeruleum* (or fungi) causing dry rot of potato tubers frequently occurs in field soils and in soil adhering to imported seed tubers before these are distributed to farmers.

Hair sprout of potatoes, R. B. HARVEY, A. REICHENBERG, B. LEHNER, and P. C. HAMM. (Minn. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 2, pp. 186–197, illus. 11*).—No large differences were found between normal and hairsprout Bliss Triumph tubers in total N, pentoses, or pentosans on a dry-weight basis. There was a consistently greater percentage of reducing and total sugars and a decrease of percentage dry weight in the hairsprout over normal White Rose tubers. The differences in sugar content were maintained at both high and low storage temperatures. There was no consistent trend in the percentages of starch.

The relationships of some viruses causing necrotic diseases of the potato, F. C. BAWDEN and F. M. L. SHEFFIELD (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 33–40, illus. 8*).—Potato virus B and some other viruses with reactions in potato varieties differing from any previously described were found to be strains of virus X; all produced intracellular inclusions varying with different hosts and virus strains. Except for virus B, the inclusions were larger and more frequent in potato than in tobacco or tomato. All gave systemic infection when inoculated into tobacco, tomato, and potato varieties in which they are carried or cause mosaic symptoms; some gave systemic infection when inoculated into varieties in which they cause top necrosis, whereas others gave only local lesions. Potato virus C was found to be a strain of virus Y; in tobacco and a few potato varieties both induced similar symptoms, but in those varieties in which virus Y causes leaf-drop streak, C caused top necrosis. Virus C caused systemic infection when inoculated into tobacco and potato varieties in which it causes mosaic symptoms, but not when inoculated into potato varieties in which it causes top necrosis. Virus C was not transmitted by the green peach aphid. Viruses C and Y produced a few small intracellular inclusions in potato and tobacco. Virus A is not considered related to Y or X; no inclusions were found in plants infected with A alone.

The determination of virus infections in the potato tuber by the use of ultraviolet light, J. G. MCLEAN and W. A. KREUTZER. (Colo. Expt. Sta.). (*Amer. Potato Jour., 21 (1944), No. 5, pp. 131–136*).—Bliss Triumph potato tubers were segregated into classes on the bases of intensity, color, and location of the fluorescence when cut surfaces were exposed to ultraviolet light. The symptoms of certain virus diseases and virus-disease complexes subsequently appearing in the progeny indicated that these infections had been identified in the tubers with reasonable accuracy on the above bases.

Tests indicate ultraviolet may be used to detect virus-infected seed potatoes, J. G. MCLEAN and W. A. KREUTZER (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 3 pp. 2, 10*).—Trials indicated that this method may be used to detect seed tubers infected with such virus diseases as spindle tuber; mild, crinkle, and rugose mosaic; leaf roll; haywire; and hairsprout due to haywire. Small tubers

(up to 1.5 in. diameter) failed to fluoresce even though infected; hence they could not be "cleaned up" by the ultraviolet method.

Disease control problems in the late potato crop, R. A. JEHLE. (Md. Expt. Sta.). (*Peninsula Hort. Soc.* [*Del.*] *Trans., 57 (1943), pp. 111–113*).

Does it pay to spray late potatoes in Delaware, J. W. HEUBERGER and T. F. MANNS. (Del. Expt. Sta.). (*Peninsula Hort. Soc.* [*Del.*] *Trans., 57 (1943), pp. 108–110, illus. 1*).—In the work reported, the organics alone failed to give as good control as the Cu fungicides, but the combination He 175 plus zinc sulfate and lime gave the best control of any material used, encouraging vigorous growth and giving the highest yield. Among the organics, He 175 and No. 604 gave promise but Spergon and Fermate showed little value against early blight. Until further research on other materials is completed, bordeaux (6–3–100) is recommended for Delaware conditions.

Soybean diseases on the Eastern Shore of Maryland, M. A. PETTY. (Md. Expt. Sta.). (*Peninsula Hort. Soc.* [*Del.*] *Trans., 57 (1943), pp. 58–62, illus. 3*).—In a survey in 1943, 13 diseases were found on soybeans in Maryland; 8 of them are discussed here. This crop is subject to attack by some disease at each phase of its growth. Seed treatment tests (1943) were not sufficiently conclusive to warrant blanket recommendations but indicated some beneficial effects.

Pathogenesis of Aphanomyces cochlioides on taproots of the sugar beet, W. F. BUCHHOLTZ and C. H. MEREDITH. (Iowa Expt. Sta.). (*Phytopathology, 34 (1944), No. 5, pp. 485–489, illus. 2*).—The symptoms observed were necrosis and blackening of hypocotyls, cotyledonary petioles, and seedling roots; blackening and disintegration of the taproot 3–6 in. below the soil line at thinning time, with wilting and indirect foliar necrosis; necrosis and blackening of excessive side roots; and greenish-yellow to brown or black semisoft rot of the lower end of large taproots. *A. cochlioides* was isolated frequently from such tissues. Inoculations with pure cultures induced symptoms like those observed in the field; in one case with beets of four ages, young roots seemed to be more susceptible than the older ones.

The sequence of infection of a seedling stand of sugar beets by Pythium debaryanum and Aphanomyces cochlioides, W. F. BUCHHOLTZ. (Iowa Expt. Sta.). (*Phytopathology, 34 (1944), No. 5, pp. 490–496, illus. 4*).—*P. debaryanum* killed 33 percent of the seedlings grown from nontreated seed in lightly infested soil, 90 percent in heavily infested soil, and 60 percent in soil where both fungi occurred together. The killing of seedlings by *P. debaryanum* was nearly completed 15 days after planting; however, very few of those developed from treated seed were killed by it. *A. cochlioides* infection began when the seedlings ceased dying from *P. debaryanum* infection, viz, about 15 days after planting. By the twenty-eighth day thereafter nearly all the remaining live seedlings, whether from treated or nontreated seed, had been attacked by *A. cochlioides*. *P. debaryanum* took its toll quickly and was readily controlled by seed treatment; *A. cochlioides* attacked older seedlings and was not controlled by seed treatment.

Sweet potato seed bed management, seed and sprout treatment, T. F. MANNS. (Univ. Del.). (*Peninsula Hort. Soc.* [*Del.*] *Trans., 57 (1943), pp. 74–84, illus. 6*).—Supported by experimental data, the author discusses the importance of slip-seed, seedbeds and their management, the value of seed treatment, practices recommended for controlling diseases, the value of hill selection, new v. old soil for the seedbed, seed selection from storage, the value of root-dip treatment, and the proportion of growers now using recommended practices.

Sweet potato sprout treatments for the control of Fusarium wilt, ineffective on the Eastern Shore of Virginia, R. P. PORTER and G. K. PARRIS. (Va. Truck Expt. Sta.). (*Peninsula Hort. Soc.* [*Del.*] *Trans., 57 (1943), pp. 85–88*).—In

previous years, preplanting fungicidal treatments of sprouts at Onley failed to reduce the incidence of *Fusarium* wilt or to increase the yields. In the 1943 tests a preplanting dip in Wettable Spergon, Semesan Bel, Yellow Cuprocide, Fermate, or Thiosan are said also to have been of no significant value on either score.

On the apparent phosphatase activity of tobacco mosaic and bushy stunt viruses, W. M. Stanley (*Arch. Gesam. Virusforsch., 2 (1942), No. 4, pp. 319–324; also in Rockefeller Inst. Med. Res. Studies, 125 (1944), pp. 485–490*).—Purified preparations of these viruses were found to possess no phosphatase activity toward disodium phenyl phosphate. Since, however, the juice of Turkish tobacco possesses phosphatase activity, incompletely purified virus preparations may show such activity due to incomplete removal of the phosphatase present in the initial material.

Stream double refraction studies on the orientation of tobacco mosaic virus particles, T. E. Rawlins. (Univ. Calif.). (*Science, 99 (1944), No. 2579, pp. 447–449*).—A discussion of possible three-dimensional orientation of tobacco mosaic particles studied by the Langmuir pipette technic.

Variation in symptoms produced by isolates of Phytomonas medicaginis var. phaseolicola, J. H. Jensen and J. E. Livingston. (Nebr. Expt. Sta.). (*Phytopathology, 34 (1944), No. 5, pp. 471–480, illus. 1*).—Four inoculation technics were used: Leaf, stem, germinated seed, and pod. On the basis of pathogenicity to Red Kidney beans exhibited in the various inoculation tests the 13 halo-blight isolates fell into 3 general groups. Four isolates were characterized by producing all halo or both halo and halo-less primary leaf lesions, typical pod lesions and marked stunting, wilting, vein-clearing symptoms, and premature death with systemic infection. Another group of 4 isolates was characterized by production of halo-less primary leaf lesions and small and reduced numbers of pod lesions; stem inoculations produced little or no stunting or wilting and rarely vein-clearing symptoms or premature death. The third group consisted of 5 isolates usually producing mixed halo and halo-less primary leaf lesions and whose pathogenicity was intermediate between the two above extreme groups. Several isolates inducing only halo-less primary lesions at 22° C. also induced only halo-less lesions at 16° and 28°, as contrasted with the behavior of other isolates, which produced halo-less lesions at 28° but typical halo lesions at 16° and 22°. In general, water suspensions of macerated tissue from typical halo lesions when sprayed on young leaves caused typical halo lesions, whereas bacteria from halo-less lesions caused halo-less lesions, but occasionally lesions unlike those from which the inoculum was obtained appeared. In all physiological culture tests the various isolates showed characteristics agreeing with those described by Burkholder (E. S. R., 63, p. 450); the only variations were slight differences in growth rates, which could not be correlated with differences in pathogenicity.

A severe necrosis caused by bean-mosaic virus 4 on beans, W. J. Zaumeyer and L. L. Harter. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 5, pp. 510–512, illus. 1*).—In addition to the already recognized local infection alone on some varieties and systemic infection alone on others, a third type of response—severe necrosis—recently noted on a strain of the Blue Lake variety of beans is here described and illustrated.

Witches' broom of beans, W. G. Hoyman. (Univ. Ariz.). (*Phytopathology, 34 (1944), No. 5, pp. 505–506, illus. 1*).—Note on cases of a witches' broom type of proliferation in string beans and lima beans in a victory garden at Tucson, Ariz.

Experiments with copper-sulfur dusts for the control of celery leaf blights, R. Nelson and A. Andersen (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 253–264*).—The long-continued use of $CuSO_4$-lime dusts has often created soil conditions unfavorable to the growth of celery; the physical properties of this

dust also result in poor flowing qualities and uneven leaf coverage. Trials of dusts containing fixed coppers, S, and talc diluents are reported to have shown their superiority in physical and fungicidal qualities. The physical properties of red copper oxide-S-talc dust proved superior to others tested and also controlled leaf blights better than other combinations tried. Copper analyses of recently dusted leaves demonstrated initial deposits of $CuSO_4$-lime in excess of those of the red copper oxide-S-talc dust, but the residual Cu on the leaves following prolonged weathering was much higher where the latter combination had been used. For controlling leaf blights in Michigan, a dust composed of red copper oxide to furnish 6 percent metallic Cu, 30 percent fine dusting S, and a highly alkaline talc diluent is recommended in preference to the standard 20–80 $CuSo_4$-lime mixture.

Controlling European corn borer and ear smut on sweet corn in the home garden, B. B. Pepper and C. M. Haenseler (*New Jersey Stas. Cir. 487 (1944), pp. 7–8*).—These pages give a brief informative account to acquaint New Jersey home gardeners with smut on sweet corn and how to combat it. That on the European corn borer is noted on page 568.

Comparative ability of the fixed coppers to control ginseng blight, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 135–144*).—Ginseng blight (*Alternaria panax*) occurs in near-epidemic form almost every year in Ohio and control is difficult. In most instances, the former recommendation of four applications of bordeaux, at intervals regulated by the stages of host development, has proved ineffective under Ohio conditions. In 1935, control was much superior at 10- than at 20-day intervals; in later experiments a 14-day interval was used. A summarized comparison of numerous Cu-containing fungicides for a 6-yr. period showed bordeaux to give the best control of foliage lesions, but some of the fixed coppers gave as good or better seed-head protection. When each member of a group of materials was compared with others in at least 11 instances, bordeaux ranked best followed closely by Copper A, and with Copper Hydro 40, Coposil, Tribasic, Cuprocide, COC-S, Basicop, and Cupro-K following in decreasing order. This ranking of the fixed coppers was somewhat similar to that given earlier on celery and carrots in that Copper A ranked first in all 3 instances and Cupro-K was at or next to the bottom of the list. As a result of these findings, as well as experience gained in controlling various *Alternaria* diseases of vegetables, the interval between sprays has been shortened to 14 days with the starting and stopping dates unchanged. Inclusion of calcium arsenate is suggested to improve disease control and afford protection against chewing insects. Bordeaux (6–6–100 or 8–8–100) with 4 lb. calcium arsenate and some good wetting agent is considered best. The first application should be made as soon as the majority of the plants are up in early May and the last about 3 weeks after bloom. This schedule will require 6–7 applications during the average season. Since bordeaux injury is likely to occur in woodlot plantings during drought periods, it is advisable to substitute one of the more effective fixed coppers in such locations; a typical formula would be Copper A plus calcium arsenate and flour or bentonite (4–4–4–100), with a wetting agent added. If the fixed copper used has a metallic Cu equivalent considerably above or below 50 percent, the amount should be adjusted to furnish approximately 2 lb. of Cu in each 100 gal. of spray.

Onion diseases and their control, J. C. Walker (*U. S. Dept. Agr., Farmers' Bul. 1060, rev. (1944), pp. 25+, illus. 16*).—A revision of the informatory pamphlet previously noted (E. S. R., 42, p. 246).

The perennial tree onion a carrier of onion-yellow-dwarf virus, P. Brierley and F. F. Smith. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 5, pp. 506–507*).—*Allium cepa viviparum* proved to be essentially a symptomless carrier of yellow dwarf virus, no symptoms sufficient for accurate diagnosis being detected

during 11 months' growth of plants in the greenhouse. The multiplier onion—also grown as a winter onion in gardens—was also shown capable of overwintering the virus, though in this case diagnosis was as readily made as in commercial varieties.

Smut resistance in an Allium species hybrid, J. C. Walker, H. A. Jones, and A. E. Clarke. (U. S. D. A. coop Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 1, pp. 1–8*).—Seedlings of the Nebuka type of *A. fistulosum* are highly resistant to smut caused by *Urocystis cepulae,* whereas the commercial varieties of onion are extremely susceptible. F_1 hybrids between the two showed considerably more resistance than the susceptible but not as much as the resistant parent; since these hybrids are self-sterile, no F_2 populations were obtained. Backcrossed to *A. cepa* the progeny proved highly susceptible, but seedlings surviving the smut test have been retained for further breeding studies. A fertile amphidiploid obtained by crossing these two species has shown considerable resistance.

Control of anthracnose on cannery tomatoes, G. L. McNew (*Canner, 98 (1944), No. 25, pp. 21–22, 46, 48, 50, illus. 3*).—Anthracnose, or ripe rot, is considered the most important fruit disease of tomatoes. The author discusses its appearance and fungus nature and summarizes spray experiments in which the new fungicide Fermate was included. The disease was very effectively controlled by four applications of Fermate (2–100) during July and August in Wayne County, N. Y. Its use has not yet been integrated with the leaf blight spray program employing copper fungicides; limited tests, however, are recommended to those having serious anthracnose problems. Emphasis is placed on not leaving overripe fruits in the field.

Reaction of Lycopersicon spp. to spotted wilt, P. G. Smith. (Univ. Calif.). (*Phytopathology, 34 (1944), No. 5, pp. 504–505*).—The results of 2 years' tests (1942-43) confirmed observations by others regarding the resistance of *L. pimpinellifolium* to the tomato spotted wilt virus. In addition *L. peruvianum* exhibits a high degree of resistance. Its resistance is difficult to use, however, because it does not cross readily with the cultivated tomato, though this has been accomplished (unpublished data) by an embryo culture technic. The susceptibility of one of two strains of *L. pimpinellifolium* in these trials indicated that this species is not uniformly resistant. The resistance encountered in the German Sugar variety of the common tomato may have promise for hybridization.

Testing copper fungicides for the control of tomato blight, M. C. Strong (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 353–362, illus. 4*).—Yields of marketable tomatoes grown in Michigan are reduced nearly every year by one or more of the three leaf "blights" caused by *Alternaria solani, Phytophthora infestans,* and *Septoria lycopersici.* Tests of bordeaux and Cu-lime dust and of a number of the fixed coppers have been carried on for several years to determine their efficacy in controlling these tomato diseases. Whether their use will be a profitable investment depends on several factors which cannot be foretold—a dry v. wet season, prices paid for the crop, a critical v. uncritical market, etc. Growers should learn to recognize these diseases and when they appear must watch weather conditions closely; if wet weather prevails, the plants should be protected with a Cu fungicide. In a season where leaf blights are serious, any of the fungicidal coppers recommended are likely to reduce losses. If bordeaux is used, an excess of lime should be avoided on account of its injurious effects. With the fixed coppers, a concentration furnishing 1 lb. of metallic Cu to 50 gal. spray is advised. Young plants in the seedbed should be sprayed with a 4–4–100 bordeaux or with a fixed copper. Because it increases the transpiration rate, bordeaux should not be applied later than 7 days previous to transplanting. To save labor and materials, withhold treatments in the field until weather and the appearance of disease make

applications necessary or desirable. The importance of clean culture practices in seedbed and field is emphasized; it is also advisable to avoid potatoes, peppers, and eggplants in the rotation, as they are all susceptible to these diseases.

Bacterial wilt of tomato caused by Phytomonas solanacearum, E. K. VAUGHAN. (U. S. D. A. coop. Ga. Coastal Plain, Ga., N. J., and Ind. Expt. Stas. et al.). (*Phytopathology, 34 (1944), No. 5, pp. 443–458, illus. 7*).—It often is not possible to distinguish noninfected tomato plants from those having incipient infection until they are grown in moist, warm soil. The organism overwinters in soils at least as far north as central New Jersey. In the soil, *P. solanacearum* apparently does not spread readily except when infested soil is moved by cultivating tools or floodwater. Infections may occur at soil temperatures as low as 55° F., but symptoms of bacterial wilt ordinarily do not become apparent at temperatures of 55°–60°. From 70° to as high as 110° soil temperatures the rate of development of the disease increases with rises in temperature. A constant but not necessarily great supply of soil moisture appears essential for growth of the pathogen It grows over a wide pH range, is killed in potato-dextrose agar cultures at pH 4, makes very little growth below pH 5, and grows best at pH 6–8.

Dry-weather disease cured by the use of borax, A. B. BURRELL. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, pp. 6–7, illus. 2*).—The diverse symptoms of the dry-weather disease of apples are described as late- and early-season internal cork and external cork of the fruits and under extreme conditions dying back of the twigs, shortening of internodes, and dwarfed, narrow, brittle leaves with more or less bronzing, reddening, and marginal spot. Losses from this boron-deficiency disease are especially severe in dry years—hence the name. Application of borax to the soil surface in an 18-in. ring beneath the tips of the branches was found effective under all conditions encountered; such treatment is considered good insurance for all orchards of the Champlain Valley as well as for those in other parts of New York where any trees have shown B-deficiency symptoms.

Bacterial spot of peaches as occurring in Maryland, W. F. JEFFERS and E. A. WALKER. (Md. Expt. Sta. and U. S. D. A.). (*Peninsula Hort. Soc. [Del.] Trans., 57 (1943), pp. 41–43, illus. 2*).—A note on *Xanthomonas pruni* infection in Maryland peach orchards.

A Cylindrocladium as the cause of a shoot wilt of varieties of plum and cherry used for rootstocks, H. WORMALD (*Brit. Mycol. Soc. Trans., 27 (1944), pt. 1–2, pp. 71–80, illus. 10*).—The fungus studied was isolated from underground parts of wilted shoots of plum, cherry, peach, and apricot, and from plum cuttings. Morphologically it resembles *C. scoparium* Morgan and is provisionally considered a form of that species, with the reservation that in its culture characters it is quite distinct from the form reported by Massey on roses (E. S. R., 38, p. 854). Experiments indicated that typical symptoms of disease can be induced by inoculating the lower leaves of shoots on plum stools in pots and then covering them with soil. Control measures are suggested.

The red-stele-resistant Temple strawberry, W. F. JEFFERS and G. M. DARROW. (Univ. Md. and U. S. D. A.). (*Peninsula Hort. Soc. [Del.] Trans., 57 (1943), pp. 43–44*).—Of about 20,000 seedlings tested, the Temple variety—a cross between Aberdeen and Fairfax made in 1938—has thus far been one of the most promising selections for resistance against *Phytophthora fragariae,* as well as for quality and other desirable characteristics.

The "phloem necrosis" virus disease of tea in Ceylon.—I, Introductory account, symptoms, and transmission by grafting, T. E. T. BOND (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 40–47, illus. 11*).—This virus disease, described from the upcountry districts, is named from the characteristic internal symptoms; ex-

ternal signs including leaf curl and zigzag and dwarf shoots are less constant and appear to be much influenced by climatic and growth conditions generally. Severely infected bushes are rendered entirely unproductive. The disease is shown to be transmissible by grafting various types of tea, some of which proved to be symptomless carriers. The theoretical aspects of the findings are discussed.

A note on the effects of splash injury in guayule seedlings, F. T. Addicott (*Phytopathology, 34 (1944), No. 5, pp. 508–510, illus. 1*).—The principal symptoms of this type of injury following overhead irrigation in California are a brown discoloration and withering at the tips and edges of the cotyledons, causing high losses of seedlings in the cotyledon stage. Photomicrographs of sections show various degrees of internal injury; the collapse of cells is preceded by plasmolysis and cytolysis. The immediate cause is believed to be nonpathogenic, no evidence of micro-organisms having been found.

Notes on basal rot of narcissus.—III, Eradication of the disease from narcissus stocks by repeated use of formalin in the hot-water bath, L. E. Hawker (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 31–33, illus. 2*).—In further investigations of this disease (E. S. R., 91, p. 46), stocks infected with *Fusarium bulbigenum* were divided into two parts, one of which was given the standard hot-water treatment and the other the same plus 0.5 percent formalin. Some stocks were lifted the following season and the treatment was repeated. With most stocks a single application of formalin was sufficient to reduce the amount of disease to negligible proportions, but with one heavily infected stock a second proved necessary.

Ornithogalum mosaic, F. F. Smith and P. Brierley. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 5, pp. 497–503, illus. 1*).—A mosaic disease of *O. thyrsoides* is described. The virus was transmissible with difficulty by sap, with a high degree of efficiency by *Aphis gossypii, Macrosiphum lilii, M. solanifolii,* and *Myzus persicae,* and with somewhat lower efficiency by *M. circumflexus.* Viruses indistinguishable from this, at least in *Ornithogalum,* were transferred from spontaneously infected plants of *Galtonia candicans,* hyacinth, and *Lachenalia* sp. The proved host range of the virus includes only species of these genera and possibly of *Eucomis*—all of them members of the Liliaceae (tribe Scilleae). The common name *Ornithogalum* mosaic virus and the Latin binomial *Marmor scillearum* are proposed.

Schroeteria delastrina (Tul.) Wint. on Veronica arvensis in Oxfordshire, L. E. Hawker (*Brit. Mycol. Soc. Trans., 27 (1944), pt. 1–2, p. 48*).—A note on stunting of the capsules of common speedwell by this smut fungus in England.

On Pythium violae n. sp. and P. oligandrum Drechsler from cultivated Viola, C. G. C. Chesters and C. J. Hickman (*Brit. Mycol. Soc. Trans., 27 (1944), pt. 1–2, pp. 55–62, illus. 3*).—During 1932–38, numerous exhibition and bedding varieties of *Viola* from all parts of Britain were found suffering from a soft rot of the collar region of the stem or of the root system; several species of *Pythium* were isolated from such infected tissues. The one most frequently isolated could not be referred to any recognized species and is described as *P. violae* n. sp. The form referred to *P. oligandrum* was isolated from diseased stems and roots of exhibition and seedling *Viola;* this is believed to be the first record of the species from Britain.

A basal stem canker of red pine, M. W. Day and F. C. Strong (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 247–249, illus. 1*).—Observations on this stem canker of *Pinus resinosa*—first noted 3 yr. ago at the Dunbar Forest Experiment Station at Sault Ste. Marie, Mich.—appear to indicate a disease caused by a fungus believed to be a weakly parasitic soil-inhabiting form able to attack only when tree growth is already impaired by a waterlogged soil.

Bees gather spores of Melanospora populina Kleb. [trans. title], G. Minz (*Hassadeh, 22 (1942), No. 6, p. 173; Hebrew text*).—Leaf rust on *Populus nigra*

usually occurs in Palestine during October-November, but sometimes earlier. The pustules protrude from the leaf and are filled with yellow spores resembling pollen. When the rust appears the bees come in large numbers to gather these spores, as first observed in October-November, 1940. In 1941 the rust appeared in the second half of August, bees gathering the spores up to the beginning of September and then disappearing. In early October the bees appeared again, thus announcing a second attack of rust. In this way the bees aided in the phenology of the fungus.

Nota sobre especies de Cuscuta de la flora Argentina [Note on the species of Cuscuta in Argentina], A. T. HUNZIKER (*Rev. Argentina Agron., 11 (1944), No. 1, pp. 70–73, illus. 1*).—On *C. bicolor* n. sp. and two other species of these vascular parasites.

Anormalidades florales en el género Cuscuta [Floral abnormalities in the genus Cuscuta], A. T. HUNZIKER and R. MARTINEZ CROVETTO (*Rev. Argentina Agron., 11 (1944), No. 1, pp. 58–65, illus. 5*).—On floral malformation such as petalody, fasciation, polyphilia, and various abnormal proliferations in this group of vascular parasites of other plants.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Some effects of flooding and waterfowl concentration on mammals of a refuge area in central Illinois, L. E. YEAGER and H. G. ANDERSON. (Ill. Nat. Hist. Survey). (*Amer. Midland Nat., 31 (1944), No. 1, pp. 159–178, illus. 2*).—The Lake Chautauqua National Wildlife Refuge consists of a bottom land of about 5,000 acres, established in 1936 and now one of the most important duck concentration areas on the Mississippi fly way. About 85 percent of the total areas is water, the level of which is maintained by dikes. The levee is of three main soil-cover types, viz, loose sand with weed and small willow cover; sandy clay with weed, vine, and sapling small tree cover; and sandy clay with weed, vine, and heavy tree cover. Only the last type was bordered by a mature forest stand. The sand levee is only about 3 yr. old; most of the others are 10-20 yr. old. This embankment affords the best site for ground dens anywhere on the north, south, and west sides of the refuge. Flooding occurred in both fall and winter, further concentrating certain mammal populations. Legal hunting near the refuge made available to carnivorous species an abundance of unretrieved and crippled ducks. The effect of flooding on mammals ranged from heavy mortality for woodchucks to apparently little basic change in behavior for minks.

During October much new den construction, mainly by woodchucks, was evident. Competition for ground dens was severe; in the absence of tree cavities, raccoons and opossums freely used ground retreats. Dens were 7 times more abundant on the mature sapling-bordered levee and 17 times more so on forest-bordered levee than on the newly constructed loose sand levee; 72 percent of the raccoon dens and 53 percent of the opossum dens were in the forest-bordered levee. There were several times more ducks on the two sections of the refuge near legal hunting grounds than on sections away from them, but dead and crippled birds were widely scattered over the entire refuge. Mallards and lesser scaups were represented in largest numbers. Carnivores took immediate advantage of the sudden availability of a new food supply. In 140 post-hunting season scats of raccoons, feathers, mainly of ducks, occurred in 55.7 percent and made up 51.7 percent of the bulk. In 26 mink scats of post-hunting origin, duck feathers were present in 23 and constituted the entire content of 18. Despite the abundance of ducks, wild fruits and field corn composed nearly 40 percent of the late fall and winter food of raccoons. Dead and crippled ducks taken by carnivores would have otherwise served no useful purpose.

Fur from farm lands, I, II, P. F. Allan (*U. S. Dept. Agr., Soil Conserv., 9 (1944), Nos. 11, pp. 256–261, illus. 5; 12, pp. 283–286, illus. 3*).—This contribution deals with the wartime value of the wild fur-bearing animals; the various ways in which different types of land, streams and ditches, and lakes and ponds may be improved for fur bearers; artificial dens and protection of burrowing animals; how to harvest the furs of the muskrat, opossum, skunk, and raccoon safely and the handling and care of the pelts; damage from fur bearers; and brief notes on fur bearers other than those above noted.

Measurement of bird populations, S. C. Kendeigh. (Univ. Ill.). (*Ecol. Monog., 14 (1944), No. 1, pp. 67–106, illus. 4*).—Following an early concentration on exploration and taxonomy in this country, measurement of bird populations began to be taken up in earnest at the beginning of the present century; there has also been considerable interest in this work in the British Commonwealth, Finland, Germany, Russia, and to a lesser extent in France. In this monographic presentation (references nearly 5 pages) the historical development of such studies is briefly summarized, and the main body of the text is concerned with the two types of measurement, viz, of relative and of absolute abundance. Relative abundance has commonly been measured as percentage of days or trips on which a species was recorded, number of individuals observed per trip or per unit of time or distance, or by a combination of these methods. Illustrations of the use of these procedures are given and their imperfections are pointed out; they were found more applicable during the wintering than the breeding season. Data on the number of bobwhite in Ohio in early winter (1908–42) suggests yearly fluctuations of a rhythmical nature, with several high and low years over the period covered. Analysis of the breeding population curve for the house wren (1915–40) showed marked low points about 1917, and in 1926 and 1940; superimposed on these major fluctuations is a possible 3–4-yr. variation. Major fluctuations are correlated with temperature variations during the wintering season above and below a critical temperature of 56° F. for this species.

In species with more than one brood per year there may be additions or subtractions to the population between breeding periods that are difficult to detect unless the birds are marked; such changes should be considered in computations. There may also be a substantial nonbreeding population that is not easy to measure; in the house wren, about 9 percent of the singing males do not secure mates for nesting at any time during the season. Use of the strip census method in the vicinity of Reelfoot Lake, Tenn. indicated bird populations during the spring migration to be 6 per 100 acres on open water in the Mississippi River, 390-640 per 100 acres in midseral forest communities, and 280 per 100 acres in the climax beech forest. In censuring total breeding populations of all species, sample plats of 50 acres for forest communities and 75 acres for open fields and grasslands are recommended for efficient coverage by one person in a day. For accurate figures on total populations during the breeding season, five complete surveys are desirable; these should be distributed over April-July. Fluctuations in number of nests from year to year appeared for most species to have only local significance. The breeding population in 55-acre oak-maple woods in central Illinois is given for 11 yr. Computations of population densities requires separation of forest-edge from forest-interior birds. Density is best expressed as number of birds (nonbreeding season) or potential pairs (breeding season) per 100 acres. Bird censuses should be restricted to single biotic communities—recognized and designated primarily by the vegetation type or life form of the dominant plants and secondarily by the dominant plant species. An analysis is made of the species composition and average number of individuals of each species making up the bird population in mature relatively undisturbed climax forests of the deciduous forest biome; the total of forest-interior species

amounted to 220 pairs per 100 acres. An appendix lists the Latin binomials of birds mentioned in the text.

Migration of the red-head from the Utah breeding grounds, C. S. WILLIAMS (*Auk, 61 (1944), No. 2, pp. 251–259, illus. 1*).—Banding returns from 2,332 young of *Nyroca americana*—banded July 14-Aug. 7, 1929-31, on breeding grounds in northern Utah—showed that the birds from this area were taken in 18 States of this country, 3 Mexican States, and 1 Canadian province. The first season of hunting is the most critical, but a 13.3 percent annual kill of young birds may be used as a basis for management. The fall migration is a filtering-out process of small groups, beginning in August and accelerating near the last of October so that the birds are largely gone by early November. The kill can be appreciably reduced by not opening the shooting season in Utah, Idaho, Wyoming, and Colorado before the first of November. The principal wintering grounds are the Salton Sea region of southern California and the lower coast of Texas. There are favored routes to the wintering grounds; these are indicated on a migration map. The need for closely chained feeding and resting habitats along the principal river systems followed by the birds is emphasized.

Southeastern limits of the spotted sandpiper's breeding range, H. M. STEVENSON, JR. (*Auk, 61 (1944), No. 2, pp. 247–251*).—The evidence obtained suggests that the breeding range of *Actitis macularia* does not include southern Louisiana and northern South Carolina and that it certainly does not extend south to central Alabama. Furthermore, for these States and Florida no published records of its occurrence during June 9-July 2 have been found, but there are two Mississippi records falling within these dates, and another record in this region probably represents breeding. Until more definite information is presented, the southeastern breeding limits of the species should be described as "middle (?) and eastern Tennessee and western North Carolina, casually to western Mississippi."

Nesting of the turkey vulture in Ohio caves, V. COLES (*Auk, 61 (1944), No. 2, pp. 219–228, illus. 5*).—Evidence of gregarious nesting was found in the Sugar Grove region of Ohio, a distinct territory surrounding each nest. Characteristic nesting sites in caves are described. Both male and female birds took part in the incubation and its length covered 38–40 days, the low temperature within the caves no doubt increasing the period. A day elapsed between the laying of the first and second eggs. Conditions of comparative cleanliness surrounded the nests.

Four species new to the Iowa herpetofauna, with notes on their natural histories, R. M. BAILEY. (Iowa Expt. Sta. et al.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 347–352*).—New amphibian-reptile records for the State.

Zoeal larvae of the blue crab Callinectes sapidus Rathbun, M. SANDOZ and S. H. HOPKINS. (Tex. A. and M. Col. et al.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 4, pp. 132–133*).

The effect of X-rays on the development of insects.—I, Irradiation in larval stage, L. HALBERSTAEDTER, G. GOLDHABER, and O. HECHT (*Growth, 7 (1943), No. 4, pp. 413–425*).—The effect of X-rays on development was studied in larvae of a bluebottle fly (*Calliophora erythrocephala*) and of the northren house mosquito. In both cases, irradiation with sufficiently high dosages caused death in the larval stage. In *Calliophora,* dosages producing no visible interference with larval development or pupation may impede formation of the imago, whereas in *Culex* successful pupation after irradiation of the larva is followed by emergence of living adults in a large proportion of cases. In *Calliophora,* death in the larval stage was almost always produced at 300,000 *r* units or more; increase of dosage in this range caused a more rapid onset of death, especially if applied at an early larval stage. After irradiation with dosages below 300,000 *r,* pupation increased with decreasing dosage. At 30,000 *r,* pupae were formed by almost all irradiated larvae.

Fly bodies were never found in pupae formed from larvae receiving dosages higher than about 4,000–5,000 *r*. Development of irradiated *Calliophora* larvae into imagoes was practically unaffected by dosages below 1,000 *r*. In *Culex*, death in the larval stage is produced in almost all cases by dosages down to 12,000 *r* and in an early larval stage by even smaller dosages; death occurs sooner after irradiation when high dosages are applied. Dosages below 12,000 *r* permit pupation in a certain percentage of cases. Following irradiation with high dosages within this range, pupation was rare and no imagoes were formed; as the dosage was decreased, the percentage of pupation increased rapidly and the number of imagoes emerging became considerable. Irradiation of *Culex* larvae with dosages of about 3,000 *r* or less was practically without effect on subsequent imago formation. It is suggested that the different response to irradiation may be due to the fact that cell division is vital to larval development in *Culex* but not in *Calliophora*.

The basic food requirements of several insects, G. Fraenkel and M. Blewett (*Jour. Expt. Biol., 20 (1943), No. 1, pp. 28–34, illus. 12*).—The method of breeding six insects (the confused flour bettle, saw-toothed grain beetle, cigarette beetle, Mediterranean flour moth, *Sitodrepa panicea* L., *Ptinus tectus*) known as widespread pests of flour on a "synthetic" diet consisting of casein, starch or glucose, cholesterol, yeast, salts, and water is described, and the relative importance of carbohydrates, sterols, and yeast is analyzed. When the diet contained water-soluble yeast extract instead of whole yeast, it became deficient in sterols and another factor in the insoluble fraction of yeast. Some of these insects required carbohydrates and others did not; the presence or absence of carbohydrates is shown to be a determining factor in insect distribution on different foods. The composition of the synthetic diet is compared with that of similar diets devised by others for such studies as this.

The vitamin B-complex requirements of several insects, G. Fraenkel and M. Blewett (*Biochem. Jour., 37 (1943), No. 6, pp. 686–692, illus. 6*).—As shown by growing on artificial diets, aneurin, riboflavin, niacin, pyridoxine, and pantothenic acid were essential for the confused flour beetle and *Ptinus tectus* Boield., while choline chloride was certainly and inositol and *p*-aminobenzoic acid were possibly important as growth factors. The cigarette beetle, *Sitodrepa panicea* L., and *Silvanus* (*Orycaephilus*) *surinamensis* L. did not appear to require some of the vitamins indispensable to the above two species because of the presence of intracellular symbiotic micro-organisms which synthesize some of them. When bred on a diet of casein, glucose, cholesterol, salts, and aqueous yeast extract, these insects also required for optimum growth a substance contained in the water-insoluble residue of yeast; this was found to be biotin. The optimum of biotin for the confused flour bettle was about 0.1 μg. per gram of the dry diet, and the threshold of action was 0.003–0.006 μg. per gram. The insects tested appeared to require no water-insoluble factor present in yeast besides sterol and biotin. Except for *Sitodrepa*, they grew on a mixture of pure B vitamins as well as on yeast extract. It is concluded that they require no B vitamins beyond those already isolated.

The sterol requirements of several insects, G. Fraenkel and M. Blewett (*Biochem. Jour., 37 (1943), No. 6, pp. 692–695, illus. 2*).—The six insects studied (*Tribolium, Silvanus, Lasioderma, Ptinus, Sitodrepa,* and *Ephestia*) were found to require sterol in the diet for growth. The amounts necessary differed among them, but the qualitative requirements were the same. The specificity of the sterol requirements was studied and is discussed.

Environmental contamination by an insect parasite and the effect on host selection, P. De Bach. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 1, pp. 70–74*).—*Mormoniella vitripennis* (Walker), a pupal parasite of

the housefly, was used in tests where the environment consisted of fly puparia dispersed through barley grains. The parasites so contaminated the grain by running over it in search of their hosts that eventually no parasitization was obtained in tests where this grain was used. When contaminated grain was cleaned with water and used in further tests, normal parasitization followed.

Quarterly bibliography on insecticide materials of vegetable origin, No. 24 (July to September 1943) (*Bul. Imp. Inst. [London], 41 (1943), No. 4, pp. 247–251*).—See also a previous note (E. S. R., 90, p. 657).

The use of Drosophila melanogaster Meig. for comparing the toxicity of stomach poison dusts, F. T. Lord (*Sci. Agr., 24 (1944), No. 7, pp. 320–326, illus. 1*).—A technic was devised and is here described for the preliminary testing of various insecticides on *D. melanogaster,* which is said to offer many advantages as a laboratory insect. Some parallel tests were also run with the blueberry and apple maggot adults which, though not conclusive, indicated that its reactions to some of the common poisons are similar to those of pomace flies. The detailed procedures and results of some of these toxicity tests are summarized and suggestions made for improvements in the methods described.

DDT—a new synthetic insecticide, C. E. Palm. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, pp. 1, 5*).—A practical account based on that of Annand et al. (E. S. R., 91, p. 312).

Preliminary studies with DDT in control of the California red scale, D. L. Lindgren, J. F. LaDue, and D. Dow. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 7, pp. 180–181, illus. 1*).

A simple insect cage-olfactometer, G. A. Hepburn (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 18 (1943), No. 1–2, pp. 7–12, illus. 2*).—The desirability of studying insect behavior under laboratory-controlled conditions is self-evident and applies notably to the sheep blowfly problem, which involves an understanding of the olfactory responses. The apparatus described may with modifications be used for studying the olfactory responses of various species of insects; a few of the results with its use are briefly discussed.

Notas Tisanopterologicas referidas a especies nuevas y conocidas de la Republica Argentina [Notes on Argentine Thysanoptera], L. De Santis (*Univ. Nac. La Plata, Rev. Facult. Agron., 3. ser., 25 (1940) (pub. 1943), pp. 89–96, illus. 5; Eng. abs. p. 96*).—Notes are presented on the onion thrips and *Halothrips* sp. attacking pyrethrum flowers, *Liothrips vernoniae* Moulton, new for Argentina, causing galls on a marsh composite (*Gymnocoronis spilanthoides*), and *Gastrothrips oeceticola* n. sp., found in cases of a bagworm (*Oiketicus kirbyi* Guild.). Mention is also made of *Eupathithrips silvestrii* (Buffa).

Concerning Neotropical Tingitidae (Hemiptera), C. J. Drake and E. J. Hambleton. (Iowa State Col.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 4, pp. 120–129, illus. 1*).—Contains the descriptions of 2 new genera, 15 new species, 1 new variety, and notes on a number of other species of lace bugs from Neotropical regions.

The Mexican species of Phlepsius (Homoptera: Cicadellidae), D. M. DeLong. (Ohio State Univ.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 4, pp. 85–94, illus. 2*).—The 7 new species here described bring the total known Mexican species to 13.

A new species of Plummerella (Homoptera: Cicadellidae) from Mexico, D. M. DeLong. (Ohio State Univ.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 1, pp. 68–69, illus. 1*).—*P. lineata* is described from tall grass in an oak forest association.

March flies are interesting but harmless, C. W. Sabrosky (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 274–276, illus. 1*).—A practical account.

Prey of the robber fly Callinicus calcaneus Loew (Diptera: Asilidae), E. G. Linsley. (Univ. Calif.). (*Pan-Pacific Ent., 20 (1944), No. 2, pp. 67–68*).—All of the prey taken with 22 specimens of robber fly consisted of megachilid and andrenid bees. The findings from this small sampling are briefly discussed.

Some genera of flies of the family Syrphidae, F. M. Hull (*Jour. Wash. Acad. Sci., 34 (1944), No. 4, pp. 129–132*).—Includes two new genera, one new subgenus, three new species, and one new combination of syrphid flies.

An annotated list of the crambid moths known to occur in Iowa (Pyralidae: Lepidoptera), G. C. Decker. (Iowa Expt. Sta.). (*Iowa Acad. Sci. Proc., 50 (1943), pp. 337–339*).—The list includes 28 species.

Notes on Agrilus, with descriptions of two new species (Buprestidae: Coleoptera), J. N. Knull. (Ohio State Univ.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 1, pp. 75–83, illus. 22*).—"It is the idea in this paper to figure the male genitalia of the North American species of *Agrilus* not illustrated to date. Since the Agrili are quite selective as to host, records of capture may lead to a more definite establishment of plants in which the species breed."

Contributions to the morphology of the larval Elateridae (Coleoptera).—I, Ludius aeripennis destructor Brown. II, Agriotes limosus Leconte. III, Agriotes Esch. and Dalopius Esch., R. Glen (*Canad. Ent., 67 (1935), No. 11, pp. 231–238, illus. 19; 73 (1941), No. 4, pp. 57–62, illus. 12; 76 (1944), No. 4, pp. 73–87, illus. 21*).—This series of papers presents the results of morphological and taxonomic studies of the wireworm family.

New Scarabaeidae from United States (Coleoptera), O. L. Cartwright. (S. C. Expt. Sta.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 1, pp. 28–36, illus. 11*).—Six new species and two new varieties of scarab beetles from the southern United States are described.

The ants of the genus Thaumatomyrmex Mayr, with the description of a new Panamanian species (Hymenoptera: Formicidae), M. R. Smith. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 4, pp. 97–99*).—Includes a key to the seven species.

Stenodynerus fundatus and related species in North America (Hymenoptera: Vespidae), R. M. Bohart. (Univ. Calif.). (*Pan-Pacific Ent., 20 (1944), No. 2, pp. 69–75*).—New taxonomy is involved in this study of the *Stenodynerus* group, and a key to the American species north of Mexico is provided.

Correlation between mandibular morphology and food specificity in grasshoppers, F. B. Isely. (*Ann. Ent. Soc. Amer., 37 (1944), No. 1, pp. 47–67, illus. 4*).—Of 89 short-horned grasshoppers (Acrididae) examined, 34 had graminivorous, 37 forbivorous, and 18 herbivorous mandibles; among the 24 long-horned species (Tettigoniidae), 10 had florivorous-forbivorous, 2 lignivorous, 2 seminivorous, 5 carnivorous, and 5 seminivorous-carnivorous mandibles. Morphologically, the mandibles were definitely correlated with food, but in the main mandible patterns followed genetic lines. Strangely enough, certain of the species which have broken away from the usual subfamily feeding behavior are also quite dissimilar in structure from typical subfamily representatives as characterized by taxonomists. Variations in mandible structure within a species were especially marked among the mixed feeders. Food specificity apparently offers tangible clues toward a better understanding of grasshopper communities and the interrelationships between these Orthoptera and plants. It seems evident that food specificity research should contribute to further progress in working out the control of insect pests. There are 52 references.

Flour, a substitute for bran in grasshopper bait, L. C. Paul and K. M. King (*Sci. Agr., 24 (1944), No. 7, pp. 332–340*).—In experiments under representative northern Great Plains conditions, a bait in which the carrier consists of low-

grade flour and sawdust (1–13 by volume) gave as good kills as the more expensive bran and sawdust (1–1) bait. Liquid sodium arsenite was the poison used in both cases, with no other ingredient except water. It is shown that because of its efficiency, availability, and low cost, the flour-sawdust bait has been used almost exclusively since 1938 in Saskatchewan, where it was first adopted on a campaign-wide scale. The minimum savings from its use in this Province have averaged about 45 percent in the cost; in the major campaign of 1939 this represented a sum of about $88,000. The aggregate savings have had an important bearing on administrative aspects of grasshopper control. Some of the other advantages of this bait are brought out, as well as the main precautions to be observed in insuring its full efficiency.

On the behaviour of wireworms of the genus Agriotes Esch. (Coleoptera: Elateridae), I, II, A. D. Lees (*Jour. Expt. Biol., 20 (1943), No. 1, pp. 43–53, illus. 9; pp. 54–60, illus. 1*).

I. *Reactions to humidity.*—The intensity of avoidance of dry air by wireworms was greatest when the alternatives were close to saturation. Within this range a difference of 7.5 percent relative humidity in the alternative chamber at 17° C. was enough to insure avoidance of the lower humidity by nearly all individuals; at lower humidity ranges progressively less intense reactions were obtained until at the low levels the response was entirely eliminated. The intensity of the reaction accorded better with humidity differences when they were expressed as saturation deficiencies rather than as relative humidities, suggesting that the reaction is initiated by the evaporation of water; the humidity "receptors" lie on the insect's head, the relevant sites being distributed between the antennae and the maxillary and labial palps. Orientation is achieved by the operation of two mechanisms: (1) Larvae are more active in dry than in moist air and (2) they show a directed response to low humidities displayed as a powerful backward recoil if the wireworms cross a steep gradient from moist into dry air. No tropotactic component is involved. This behavior can readily be correlated with the humidity conditions prevailing in the soil; the necessity for such a sensitive response is possibly dictated by the cuticular permeability, which renders wireworms peculiarly liable to water loss in unsaturated atmospheres.

II. *Reactions to moisture.*—Simple methods are described by which wireworms could be offered the choice of two alternative moistures. The extension of a burrow system by a single larva was found to fall off with time; it is believed that under natural conditions such a system is semipermanent. Wireworms migrated rapidly out of dry sand and aggregated in wet sand, due solely to the differential effect of moisture on the burrowing activity. Burrowing wireworms do not respond to gravity. The feeding activity of a small larval population was much greater at low than at high moistures, resulting partly from inactivity of the larvae under high moistures and their consequent failure to reach the food. Excess moisture, however, also inhibited all muscular activity, and this influenced the manipulation of the mouth parts during feeding and locomotion alike. These results agree well with a number of purely ecological observations on wireworm behavior.

A preliminary list of the Elateridae of Iowa, B. Owen and H. E. Jaques (*Iowa Acad. Sci. Proc., 50 (1943), pp. 341–344, illus. 1*).—This list includes 107 species of click beetles (wireworms).

Controlling European corn borer and ear smut on sweet corn in the home garden, B. B. Pepper and C. M. Haenseler (*New Jersey Stas. Cir. 487 (1944), pp. 1–7*).—These pages give a practical account of the European corn borer. That on ear smut is noted on page 558.

Controlling cotton insects, C. Lyle and A. L. Hamner (*Farm Res. [Mississippi Sta.], 7 (1944), No. 5, pp. 1, 6*).—A practical account.

Which is better, spraying or dusting potatoes?, H. S. Telford and J. A. Munro (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 5, pp. 9–10*).—These studies show that under North Dakota conditions there was little difference in yield between sprayed and dusted potatoes. In a field where the yield was about 150 bu. per acre the application of copper increased yields from 17 to 20 percent over plats not copper treated.

Early irrigations most effective method of controlling root louse on sugar beets, C. R. Jones (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 3, pp. 8–10, illus. 1*).—According to the author, the best method for control of the root louse on sugar beets is to provide favorable conditions for beet growth, including proper soil fertility, and to follow recommended cultivation and irrigation practices.

The seasonal cycle of insect abundance in Puerto Rican cane fields, G. N. Wolcott and L. F. Martorell (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1943), No. 2, pp. 85–104, illus. 12*).—A practical account on toads, several insects, and a mite observed in Puerto Rican canefields during a 5-yr. period.

Hespéridos americanos cuyas larvas perjudican la caña de azúcar [American Hesperiidae, the larvae of which injure sugarcane], K. J. Hayward (*Rev. Indus. y Agr. Tucumán, 33 (1943), No. 1–3, pp. 11–18*).—Species of 12 genera of this lepidopterous family are considered. There are 22 references.

Natural parasitism by Trichogramma minutum of the eggs of the sugarcane moth borer, Diatraea saccharalis, in the cane fields of Puerto Rico, G. N. Wolcott and L. F. Martorell (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1943), No. 2, pp. 39–83, illus. 7*).—According to the authors, the sudden drop in abundance of egg clusters of the sugarcane borer in northwestern Puerto Rico in late summer is due to natural control by the egg parasite *T. minutum* Riley. In other parts of Puerto Rico factors responsible for the initiation, height, and usually shorter duration of abundance of egg clusters apparently depend on temporary and partial failure of biologic control in previous generations of the host. Parasitism averages higher in fields where host eggs are most numerous. Fields with more than five fresh egg clusters per man-hour of examination and parasitism not greater than 33 percent constituted about one-tenth of all fields, and these offer the best opportunity for release of laboratory-reared parasites.

Tests indicate several materials can be used for control of Mexican bean beetle, G. M. List (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 3, pp. 11–13, illus. 1*).—Various insecticidal materials, including rotenone, cryolite, and basic copper arsenate sprays and dusts and phenothiazine sprays were compared on two varieties of beans with a zinc arsenite spray for Mexican bean beetle control under Colorado conditions. A table compares mean plat yield, computed acre yield, and mean larval population of the treated beans, eight insecticidal combinations showing yields significantly greater than those from arsenite of zinc.

The cabbage maggot, W. D. Whitcomb (*Massachusetts Sta. Bul. 412 (1944), pp. 28, illus. 5*).—This insect has three generations annually in Massachusetts, of which the first is the most destructive to early cabbage and similar crops, while the third often damages late turnips and radishes seriously. Successful control should be based on the activity of the insect, and in these studies it has been related with the time when the first eggs are laid (April 29-May 10). Commercial injury has occurred on 78.7 percent of the untreated cabbage at Waltham during the past 14 yr. Crop rotation, fall plowing, and similar cultural practices help reduce losses. Corrosive sublimate solution 1–1,920 applied at the rate of 1 gal. to 40 ft. of row is suggested as a seedbed treatment, while calomel and talc is mentioned for pretransplanting treatments. Repellents, toxic dusts, and toxic liquid drenches are discussed from the standpoint of field control. Eight literature citations are included.

Life history studies of the pea moth (Laspeyresia nigricana (Steph.)) on the Gaspe coast, A. D. Baker and J. P. Perron (*Sci. Agr., 24 (1944), No. 7, pp. 341–349, illus. 1*).—Records of observations on the life history of the pea moth in the Province of Quebec (1936–42) are presented and compared with all available records of the life cycle of the insect by other North American workers (14 references). As yet there is no direct evidence that a second generation occurs on the Gaspe coast. It has been found that if the larvae are allowed to spin up their cocoons in soil in the fall and maintained thereafter at room temperature with sufficient moisture, most of them will pupate and emerge as moths around December of the same year. The times of adult emergence, preoviposition, egg laying and maturity, larval development and emergence from pea pods, cocoon formation, pupation, etc., are dealt with.

Codling moth control: Use of nicotine to destroy the moth stage, W. S. Hough. (Va. Expt. Sta.). (*Amer. Fruit Grower, 64 (1944), No. 4, pp. 8, 26, illus. 3*).—The results of orchard tests reported indicate that free nicotine or nicotine sulfate (but not nicotine bentonite) are effective as moth-killing agents, that the spray must envelop the tree quickly, and that it is important to spray the top half of the tree at the same time as or before the lower half. In practice, nicotine at 0.75 pt. per 100 gal. is used in the second and third cover sprays, though 1-pt. strength gave a slightly higher kill in the experimental work. Since nicotine is expensive its use is limited to cases where the usual codling moth program is unsatisfactory. The object is to destroy the large moth population in May-June and thus reduce the amount of egg laying. When oil is added in ovicidal dosage in the second and third cover sprays, hatching of the worms is further reduced. It is thus possible to lower the first-brood worm attack to a point where lead arsenate will give results without a large percentage of fruit showing conspicuous and numerous stings. A fourth spray using lead arsenate and a fifth in July or August against the second brood is the usual concluding orchard practice. Operators sensitive to nicotine can be protected by the simple gas mask described and illustrated.

Advances in codling moth control and costs, using the new schedules, G. E. Marshall (*Amer. Fruit Grower, 64 (1944), No. 4, p. 12*).—A table is presented to go with the contribution previously noted (E. S. R., 91, p. 179), with further accompanying explanation.

The apple maggot, C. R. Cutright and T. H. Parks (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 168–172, illus. 5*).—Flies emerge as early as July 4 and appear in largest numbers the last 2 weeks in July and early August. In the vicinity of Wooster, emergence is usually over by August 25. Adults feed 7–10 days before beginning oviposition. Apple maggots are not troublesome in orchards where numerous spray applications are used for codling moth control. In orchards less thoroughly sprayed, two or three special applications of either lead arsenate or calcium arsenate are often necessary for apple maggot control.

Control of red mite, C. R. Cutright. (Ohio Expt. Sta.). (*Amer. Fruit Grower, 64 (1944), No. 4, pp. 9, 20, 33, illus. 5*).—The results of a 5-yr. experimental program against the European red mite on apple showed that summer spray schedules using different sulfur preparations have almost identical effects on mite populations. Sulfur compounds in summer applications aid this mite by their toxicity to the predaceous mites, the latter being the chief agents in natural control. Dormant oil is still considered the standard control. Summer populations of red mite may be greatly reduced by applications during the growing season of summer oil or summer dinitro; of these two materials the latter appeared more efficient.

The mirid Calocoris norvegicus Gmelin, a strawberry pest in Nova Scotia, A. D. Pickett, M. E. Neary, and D. MacLeod (*Sci. Agr., 24 (1944), No. 6, pp.*

299–303).—For several years normal-appearing plants in Nova Scotia would produce malformed fruits or fail to develop them at all. Though other factors may at times be involved, this mirid was believed to be the most frequent cause, and further observations and tests with potted caged plants proved beyond reasonable doubt that it causes fruit abnormalities similar to those encountered in many strawberry plantations throughout the Province. The pest has also been taken on a variety of wild and cultivated host plants, sheep sorrel (*Rumex acetosella*) being the most common. Burning the mulch reduced its incidence, but this is not considered good horticultural practice. Sprays or dusts cannot at present be recommended with confidence, though use of nicotine sulfate has given some promise. Control methods are thus in need of further investigation.

Controlling the fruitworm on blueberries, R. Hutson (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 283–284, illus. 1*).—During a 2-yr. period under Michigan conditions 1 qt. of summer oil and 3 lb. of factory-processed fixed nicotine or a 1-percent rotenone compound with a spreader have markedly reduced the number of infested berries. The spray was applied at the rate of 200–250 gal. per acre and timed to go on when the berries were about the size of buckshot and again in 10 days. Infestation was reduced in sprayed plats between 70 and 85 percent.

The rose chafer or rose bug, J. S. Houser and C. R. Cutright (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 173–174, illus. 1*).—A practical account which suggests that a satisfactory spray for the rose chafer or rose bug may be made of 4 lb. of lead arsenate, 0.5 gal. of cheap sirup, and 50 gal. of water. Limitations on its use and other control methods are also suggested.

Avocados and their insect allies, D. F. Palmer (*Calif. Citrog., 29 (1944), No. 6, pp. 162–163*).—A brief summary of the control of avocado pests by parasitic or predatory insects; until now there is only one, the greenhouse thrips, for which no satisfactory control has yet been developed.

Control of orange worms, A. M. Boyce, R. B. Korsmeier, and R. C. Dickinson. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 7, p. 179*).—The term "orange worms" is used locally to refer to the caterpillars of four small moths—*Holcocera iceryaeella* (Riley), *Platynota stultana* Wals., *Pyroderces rileyi* (Wals.), and the orange tortrix. The last is much more generally important in damaging fruits than any of the others; it may be controlled by cryolite as a dust or spray, incorporated with DN-Dust or DN-Dust D8 for control also of the citrus red mite, or with DN-sulfur dust for control also of the citrus red mite and the citrus thrips. Tests with cryolite against *P. rileyi* have not been promising.

European corn borer attacks gladiolus, M. D. Farrar. (Ill. Nat. Hist. Survey). (*Gladiolus Sup. [New England Gladiolus Soc.] [8] (1944), No. [1], pp. 21–23*).—Serious destruction of flower spikes in early planted gladiolus is reported from Illinois (1943). In a series of spray tests against the pest, the formula giving most promise was made up of powdered cube root (5 percent rotenone) 4 lb., summer oil emulsion 0.5–1 gal., "Areskap" 6 oz., and water 100 gal.

The pine root-collar weevil, J. V. Schaffner, Jr., and H. L. McIntyre. (U. S. D. A. et al.). (*Jour. Forestry, 42 (1944), No. 4, pp. 269–275, illus. 2*).—The pine root-collar weevil, apparently a native insect first reported in 1926, is now known from New England south to Virginia and west into Minnesota and as a serious pest of Scotch, Austrian, and Corsican pines in forest and ornamental plantings in New England and New York. Heavy infestations, however, have been observed only on light sandy soils. Attacks on other pines appear to occur only where trees are adjacent to or interplanted with heavily infested preferred hosts; it is not a pest in areas of natural reproduction of native species.

The adults feed at night on the bark of lateral and terminal twigs and in heavy infestations cause considerable injury; during daylight they hide at the tree bases.

The principal injury is from the larvae, whose entire life cycle is spent in the root collar cambium. Trees may be infested many years without heavy mortality though they become badly stunted, with very large butts compared to their height. Eventually such trees are girdled and die, are broken by the wind, or succumb to bark beetles.

A few of the chemicals tried have given promising results but not complete control, and the cost is usually prohibitive except in ornamental plantings. Best results have been obtained with an emulsion containing 25 percent ethylene dichloride and 5 percent dichloroethyl ether, or one containing 25 percent ethylene dichloride and dinitro-*o*-cyclohexylphenol (100 percent) at the rate of 0.5 oz. per gallon. These emulsions are applied directly around the bases of infested trees.

Larval longevity in Buprestis aurulenta Linn, E. G. LINSLEY (*Pan-Pacific Ent., 20 (1944), No. 2, p. 52*).—A further record (E. S. R., 89, p. 562) of delayed emergence of larvae of this wood-boring beetle.

The prevention and control of termite damage, J. B. SCHMITT (*New Jersey Stas. Cir. 484 (1944), pp. 11, illus. 6*).—A practical account.

Insect infestation of dehydrated foods, E. G. LINSLEY. (Univ. Calif.). (*Canner, 98 (1944), No. 18, pp. 26, 28*).—Available new information on insect infestation of dehydrated products is limited primarily to vegetables, fruits, fish, eggs, milk, and certain other dairy products; the data briefly summarized here are of a preliminary nature and are largely derived from laboratory experiments which are still in progress.

The oviposition responses of Calandra granaria Linn., L. E. S. EASTHAM and S. B. MCCULLY (*Jour. Expt. Biol., 20 (1943), No. 1, pp. 35–42, illus. 3*).—The oviposition responses of this grain weevil as measured by oviposition rate, total eggs laid, and lengths of life, ovipository life, and preovipository period were studied under controlled conditions of temperature and atmospheric saturation deficiency, the grain having been acclimatized in its water content to the relative humidity of the air. The weevils lived for a shorter time under high than under low temperatures but laid eggs at a greater rate. There was evidence for the existence of an optimum saturation deficiency at each temperature for oviposition rate. Weevils were shorter lived and the total of eggs laid was smaller at high than at low saturation deficiencies of the air. The water content of the food grain contributed to these results in that dry food was conducive to a low oviposition rate, low total egg production, and shorter life.

The respiration of Tyroglyphus farinae, T. E. HUGHES (*Jour. Expt. Biol., 20 (1943), No. 1, pp. 1–5, illus. 2*).—The reactions of this mite to varying concentrations of CO_2 and O_2 and to the presence of small amounts of HCN were studied to obtain some insight into its hitherto little known respiratory activities. It was found nonviable at relative humidities of less than 65.5 at 20° C. The normal respiratory quotient was around 0.9, indicating respiration of a carbohydrate base. The O_2 absorption was in part cyanide-sensitive, suggesting the presence of a "cytochrome-cytochrome oxidase" mechanism. Anesthesia was produced by CO_2 concentrations above 30 percent atmospheric and by O_2 concentrations below 1.2 percent. The external atmosphere over flour was no guide to the internal conditions within the flour. When exposed to pure CO_2 for 72 hr. the mites were killed; they survived 48 but not 72 hr. in atmospheric N.

A rare variant of Pollenia rudis, the Iowa winter house-fly, D. T. JONES (*Iowa Acad. Sci. Proc., 50 (1943), pp. 345–346, illus. 2*).

A key to the Anopheles of the southeastern United States, by male genitalia (Diptera: Culicidae), L. M. ROTH (*Amer. Midland Nat., 31 (1944), No. 1, pp. 96–110, illus. 60*).—Of the 11 mosquito genera known in the southeastern United States, those species belonging to the genus *Anopheles* are most important to man.

since it is the females of this group which transmit the protozoa of human malaria. The 10 species of *Anopheles* found in the Southeast are distributed among 9 of the Southern States; these are discussed, along with the technic of study used, prefatory to presentation of the key.

The temperature relations of the immature stages of the malarial mosquito, Anopheles quadrimaculatus Say, with a comparison of the developmental power of constant and variable temperatures in insect metabolism, C. B. Huffaker. (Ohio State Univ. and Univ. Del.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 1, pp. 1–27, illus. 2*).—The reciprocal catenary curve $t=(m/2)(a^T + a^{-T})$—where $t=$ time, $m=$ developmental time at the empirically determined optimum, a is an empirically established constant which determines the slope of the curve, and T is the temperature in degrees above or below the optimum—seems the most adequate and adaptable method yet advanced for expressing the relation of temperature to velocity of insect development. This formula is derived from two simple exponential functions, one representing an accelerative and the other an inhibitive effect of increased temperature. The reaction of development of the common malaria mosquito was found to have the same general form for the total developmental period as for any component stage, but there was a significant shift in the optimum temperature from about 33.3° to 30.3° C. as development progressed from embryonal to imaginal phases. Its time-temperature relation in development conformed remarkably well to the catenary formula. The optimum developmental temperature is about 31°, and the time required to complete development from newly hatched larvae to adults may vary from as high as 1,572 hr. at 12.1° to about 176 hr. at the optimum. The shortest time required to complete each stage was near 30 hr. except for the fourth instar, which was about 55 hr.

The threshold of development was about 7°, the lowest generally lethal high about 35°, and the highest generally lethal low about 11°. High temperatures had an accumulative injurious effect. That lethal high temperatures are associated with coagulation of protoplasm is believed untenable; death at these temperatures may be similar to starvation at lower temperatures. The metabolic power of variable temperatures was greater, generally, than that of constant temperatures, probably attributable to an inherent inability to maintain the initial metabolic rate at high tempertures. The degree of acceleration of variable temperatures was greatly affected by the exact nature of the variation; exposures to low temperatures of 17° or slightly lower were far more powerful in promoting increased metabolic rates than were exposures to higher low temperatures, probably because different important phases of metabolism respond to temperatures differentially. This information should facilitate determination of the time interval between larvacidal applications and the temperature at which purely physiological and medical experiments with this mosquito should be conducted. There are 44 references.

Excretion of dyes from the body of Anopheles maculipennis by the excretory and phagocytic organs [trans. title], Z. M. (S. M.) Denisova (*Zool. Zhur. (Zool. Jour.), 22 (1943), No. 5, pp. 259–262; Eng. abs., p. 262*).—Injection of dyes showed that in mosquitoes (Culicidae), as in most other insects, the Malpighian tubes excrete indigo-carmine and the pericardial cells ammonia-carmine. The pericardial cells vary somewhat with respect to cell size, shape, and number in every segment of different genera of this family, such as *A. maculipennis, Aedes caspius dorsalis,* and the northern house mosquito. Accumulations of india ink suspension were detected in the pericardial tissue. The injection method is considered suitable for experimental studies of mosquito physiology.

Culex (Melanoconion) atratus Theobald in Florida, a new continental North American record, with notes on the other Melanoconions of the southeastern United States, L. M. Roth and F. N. Young (*Ann. Ent. Soc. Amer., 37 (1944),*

No. 1, pp. 84–88, illus. 7).—A key to the male terminalia of the dark-legged species of this mosquito genus, given by King et al. (E. S. R., 88, p. 81), is here modified to include the new form *C. atratus*. Descriptions of the ninth tergites have been amplified, whereas that part of the key dealing with the subgenus *Culex* is omitted.

Mosquito control in Michigan, 1944, E. I. McDaniel (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 297–302, illus. 4*).—A practical account.

Mosquito oils, larvicides, repellents, outdoor sprays, and their application, J. M. Ginsburg (*New Jersey Stas. Bul. 711 (1944), pp. 12, illus. 2*).—This publication discusses mosquito oils with particular reference to toxic properties, stability and lasting properties, penetration and spreading properties, and quantities of oils; mosquito larvicides, including pyrethrum, soap, phenol, and paris green dust; spraying equipment; protection from adult mosquitoes of individuals and groups of individuals; and relief from mosquito bites. A selected list of 16 references is included.

Entomological phases of the recent dengue epidemic in Honolulu, R. L. Usinger (*Pub. Health Rpts. [U. S.], 59 (1944), No. 13, pp. 423–430*).—Mosquitoes are recent immigrants to Hawaii and only three species—the southern house mosquito, the yellow fever mosquito, and *Aedes albopictus* (Skuse)—are now represented there. The history of mosquito-borne infections and parasites in the islands and the systematics, habits, and control of the last two species of mosquitoes (incriminated in various parts of the world as vectors of yellow fever, dengue, etc.) are briefly reviewed. The relation of *Aedes* mosquitoes to the 1943 epidemic of dengue is said to be rather unique especially in that the correlation of cases was with density of human population rather than with that of mosquitoes; this is ascribed to the short flight range of these species and the presence of more people to be infected in the populous areas, as well as to the dilution factor in mosquito bites when people are few and mosquitoes are present by the thousands.

The transmission of Actinomyces rhodnii Erikson in Rhodnius prolixus Stål (Hemiptera) and its influence on the growth of the host, G. Brecher and V. B. Wigglesworth (*Parasitology, 35 (1944), No. 4, pp. 220–224*).—Symbiotic micro-organisms appear to occur in all blood-sucking insects feeding solely throughout their life cycle. *A. rhodnii* was isolated regularly from this vector of Chagas' disease reared in the laboratory. It was not found to be transmitted in the egg but was taken in by the young nymph from the environment, sometimes from the contaminated egg surface but perhaps more often from the dry excreta of other members of the species. This bug has been reared free from *Actinomyces* by sterilizing the egg surface and feeding under suitable precautions. These sterile insects grew and molted normally until the fourth or fifth instar; molting was then delayed or failed entirely in spite of repeated feedings of blood. Very few individuals without *Actinomyces* became adults and those few were almost certainly incapable of reproduction, but normal growth and molting and egg production were resumed on reinfection.

New parasitic mites (Acarina) from rodents, C. D. Radford (*Parasitology, 35 (1944), No. 4, pp. 161–166, illus. 11*).—Of the seven mites here described, six are new species.

The ecology of the sheep tick, Ixodes ricinus L.: Distribution of the tick in relation to geology, soil, and vegetation in northern England, A. Milne (*Parasitology, 35 (1944), No. 4, pp. 186–196, illus. 1*).—The castor-bean tick is the only tick infesting sheep in northern England, though *I. canisuga* Johnston has been found on sheep dogs and foxes. The former is distributed with marked discontinuity, the total infested areas including only about one-fifth of the hilly country, to which it is almost exclusively confined. Broadly speaking, where surface

geology lends itself to relatively good natural drainage and soil, the grazing is relatively good and ticks are absent; with relatively poor drainage and/or soil, the grazing is relatively poor and ticks are present. No consistent correlations were found of pH, available P and K, soil texture, mechanical analysis, soil depth, or quality of natural drainage with tick distribution. The interaction of soil and natural drainage factors, however, profoundly influenced the character of the vegetation layer. In the four northern counties of England the same plant dominants occurred on tick-infested and tick-free hill lands. Where grazing was poor, ticks were usually present irrespective of whether the dominant plant was one of rough grasses, bracken, or heather; where grazing was relatively good, ticks were invariably absent. Observations on a smaller scale indicated that the thicker (i.e., rougher) the vegetation layer the denser the tick population and also the thicker the vegetation layer the thicker the basal mat. On five plats it was shown that there was a consistent positive correlation between mat thickness and tick population density, viz, the thicker the mat the denser the tick population irrespective of whether bracken or grass was dominant. Thus, it is concluded, the chief controlling factor in tick distribution is the physical character of the vegetation layer.

The spotted fever and other Albertan ticks, J. H. Brown (*Canad. Jour. Res., 22 (1944), No. 2, Sect. D, pp. 36–51, illus. 4*).—*Dermacentor andersoni* Stiles is present in large numbers throughout the greater part of southern Alberta, as shown by the numbers of drag and host ticks collected. Two collections (at Manyberries and Lethbridge, respectively) showed the ticks infected with the *Dermacentroxenus rickettsi* of spotted fever; 16 collections in southern Alberta were positive for *Pasteurella tularensis*. The known range of this tick extends from the Montana border on the south to Township 33 on the north and from the Saskatchewan boundary on the east to that of British Columbia on the west. The area of greatest abundance is the semiarid range land south of the Canadian Pacific Railway from Walsh to the Crow's Nest Pass. Within this area the density of the tick population varied with the district, but the highest incidence was found along the river valleys and in the coulees. Ticks were more plentiful in small coulees and draws well covered with vegetation and with many cattle paths, the majority usually occurring on the western and southern slopes. The importance of this tick cannot be overrated since it is a known vector of spotted fever, tularemia, and human and animal paralysis in this Province. During the survey a new disease of man, believed to be transmitted by this tick, was located in the Eastend District of Saskatchewan. Nine other tick species are known to be present in Alberta, but they were not studied in detail. Two of them—the bird tick and the rabbit tick—are known to be disease vectors.

The behaviour of a population of honeybees on an artificial and on a natural crop, C. G. Butler, E. P. Jeffree, and H. Kalmus (*Jour. Expt. Biol., 20 (1943), No. 1, pp. 65–73, illus. 6*).—When 112 petri dishes filled with sugar sirup were arranged at 20-yd. intervals in a meadow, individual bees visited a chosen dish with great regularity for 1 or more days, provided the supply did not become exhausted. Occasionally bees marked on one dish visited an adjacent one, this occurring most frequently when the original sirup supply failed temporarily, but even after a 3-day interruption bees often returned to feed at the original site. Bees feeding at a dish full of sirup spent only about 1 min. per visit drinking, but several times as long flying to and from the hive and delivering their load. When the sirup supply in a dish became exhausted all the bees accustomed to visit it gradually accumulated there impatiently; after some minutes they extended their radius of search and many located another source close at hand. Thereafter they visited either the new source or the old, or both, when the sirup at the original site was replenished. The nearer the new source to the original one the more likely a bee was to find it. Bees were

deterred from collecting sirup from dishs even partially in the shade, and they apparently preferred not to fly in the direction of shady trees. Over the 160–400-yd. range there were always more visitors to the nearer dishes, the extent of this difference varying, however, from day to day. Bees accustomed to collect from dishes farthest from the hive did not move to nearer sites under unfavorable weather, but there was some evidence that those working at a long distance from the hive were more easily deterred from foraging by such weather. The number of visitors was greater to high- than to low-concentration sirup, and even after all the dishes had been refilled with sirup of uniform concentration this difference remained noticeable.

Bees marked on a patch of *Epilobium angustifolium* in the midst of a large crop of this plant were usually recovered within 5 yd. of the original point; comparable results were obtained on isolated patches of *Echinops sphaerocephalus*. The time spent by foraging bees on the flower heads of *Echinops* on any one visit greatly exceeded that spent in collecting sirup from a dish, but the time spent between hive and flowers was about equal in each case. Only a small proportion of the population of bees working on a particular dish could be found feeding there at any one time, whereas on a patch of flowering plants, with good weather, most of the population visiting that patch would be found there at any one time. This great difference in behavior on dishes as compared with plants must be borne in mind in any experiments using dishes.

Migrating platform apiaries, L. C. Nieb (*Gleanings Bee Cult., 72 (1944), No. 5, pp. 190–192, illus. 3*).—By the method described and illustrated, the hives of the apiary are securely fastened to a platform; when ready to move the apiary, this platform is secured on a truck trailer and moved by night, when the field bees have all returned to their respective hives.

A method of swarm control incorporating re-queening, D. S. Hudson (*Bee World, 25 (1944), No. 4, pp. 26–28, illus. 1*).

A method of increasing beeswax production, C. A. Jamieson (*Gleanings Bee Cult., 72 (1944), No. 5, pp. 188–189, illus. 1*).—Preliminary report.

Suggestions for reducing bee losses in Utah, G. F. Knowlton (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 2, p. 12, illus. 1*).—A practical account.

Poisoning of honeybees, G. F. Knowlton (*Utah Sta. Mimeog. Ser. No. 310 (1944), pp. 11*).—An abstract of selected references from the literature.

Physiology of the silkworm, I, II (*Physiol. Zool., 17 (1944), No. 1, pp. 71–78, illus. 4; pp. 78–82, illus. 1*).

I. *Growth and respiration of Bombyx mori during its entire life-cycle,* T. Y. Hsueh and P. S. Tang.—Observations were made simultaneously on the growth and respiration of the silkworm during its entire life cycle. The weight of the eggs after removal from cold storage decreased steadily from 0.49 mg. per egg on the first day to 0.46 mg. on the tenth—the day before hatching. The larval weight increased from 0.35 mg. on the first day of feeding to 2,418 mg. on the last; at the end of spinning it was reduced to about 930 mg. The pupal weight was about 900 mg. on the fifth day of pupation and declined to about 850 mg. at the end. The approximate weights of the adult moths were 200 mg. for the male and 600 mg. for the female (reduced after laying about 400 eggs to 400 mg.). The rates of O_2 consumption from the egg through the moth stages are presented and discussed in detail along with the metabolic implications. The low value of 0.6 for the respiratory quotient during spinning indicated conversion of fat into carbohydrate and possibly also into proteins. A characteristic U-shaped curve was obtained for the respiratory rate during pupation, with the minimum at the third to the twelfth days. The R. Q. values during this period were 0.6–0.75. A straight-line relation was obtained when the logarithms of the weights on the first and last days of feeding and those at each molt were plotted against time in days following hatching.

II. *Mechanisms of silk formation as revealed by X-ray analyses of the contents of the silk gland in Bombyx mori,* C. P. Ho, S. M. Shen, P. S. Tang, and S. H. Yü.—As shown by X-ray diffraction patterns on wet and dried silk-secreting glands, the chemical nature of the contents are essentially the same for all three parts of the gland and in the moist condition are in aqueous colloidal suspension. The gland contents differ from the silk fiber only by being uncoagulated and by having the molecular aggregates in random arrangement, as against the orderly arrangement in the silk fiber. Transformation of the amorphous gelatinous glandular contents into the orderly crystalline arrangement of the molecules in the silk fiber is accomplished simply by applying tension to the long axis of the fiber and pressure on the side in the direction normal to the tension.

ANIMAL PRODUCTION

Chemical composition of some American wild feedstuffs, T. R. King and H. E. McClure. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *69* (*1944*), *No. 1, pp. 33–46*).—Analyses of 120 samples of American wild feedstuffs, including legume seeds, grass seeds, miscellaneous seeds, mast, fruits, and tubers, showed that legume seeds have good nutritive value as indicated by their high protein and nitrogen-free extract content. Grass seeds and fruits are of lower nutritive value and supply mainly nitrogen-free extract. However, some of the fruits contain considerable fat. Most mast seeds are concentrated feedstuffs, generally having a high protein and a low nitrogen-free extract content. The nuts in this group have a low protein and high nitrogen-free extract content. Considerable variability was found in the quantity of fat in both seeds and nuts.

The influence of war-time milling control on the composition, digestibility, and nutritive value of the wheaten offals, H. E. Woodman and R. E. Evans (*Jour. Agr. Sci.* [*England*], *34* (*1944*), *No. 1, pp. 35–48, illus. 1*).—Raising the rate of flour extraction of wheat from 70 to 75 percent in the early stage of the war increased the fiber content from 6.98 to 8.59 percent for fine wheat feed. The contents of fiber in the other feeds were, fine bran 10.82 percent, coarse bran 11.85, fine millers' offals 11.87, and coarse millers' offals 15.46 percent. Close agreement in chemical composition was found between coarse bran and pre-war broad bran. In sheep digestion experiments, the digestibility of wheat byproducts decreased with increasing fiber, but increasing the extraction from 70 to 85 percent did not lead to any serious depression of the nutritive value of the coarse fraction of the wheat products; coarse bran was little inferior to pre-war bran in respect to starch equivalent. Increased flour extraction caused a marked decline in the nutritive value of the finer grades of wheat byproducts. The finer products suffer a bigger drop in starch equivalent in extraction from 70 to 75 percent than when extraction is increased from 75 to 85 percent. Additions of 10 percent barley in the wheat before milling did not cause significant effect on the finer wheat products for ruminants. The barley husk causes the coarse millers' byproducts to have a low starch equivalent. In bacon pigs of more than 120 lb. live weight, the coarse grades of wheat byproducts may constitute up to one-third of the ration without causing digestive disorders. Increased fiber caused a fall in digestibility of wheat products in the pig. The fine millers' products were distinctly poorer for pigs than fine bran, but differences were scarcely discernible for sheep because the fine part of barly husks finds its way into the fine millers' offals, which sheep are able to utilize more efficiently than pigs. Only the fine wheat feed and fine bran were really suitable for use as major components of the rations for growing and fattening pigs. Increased grinding of the coarser bran raised the digestibility of the organic matter by pigs only from 56.5 to 59.8 percent, which was insufficient to pay for the cost of labor involved.

Sheep and pigs were able to digest the fine grades equally well, but sheep could utilize the coarser grades better than swine.

Commercal feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 510 (1944), pp. 30*).—The guaranteed and found analyses are presented for 1,338 samples of commercial feeding stuffs offered for sale in Vermont in 1943. Guaranties were not as well maintained as usual (E. S. R., 89, p. 718), 17 percent of the crude stocks and 12 percent of the proprietary feeds being deficient.

Vitamin A is essential to profitable livestock production (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 5, pp. 2–4*).—Insufficient vitamin A in the feed during the fall and winter may be responsible for a large proportion of the losses of young animals; low milk flow of sows, ewes, and cows; deaths among breeding animals; and low egg production. Hay must be cured with a bright green color and stored to protect against weather damage for the preservation of maximum vitamin A.

The stability of vitamin D in fortified fish oils, R. J. EVANS, M. RHIAN, J. S. CARVER, W. S. HAMM, and R. W. HARRISON. (Wash. Expt. Sta. et al.). (*Poultry Sci., 23 (1944), No. 2, pp. 91–93*).—As certain fish oils have been found to be low in vitamin D potency, study was made of the biological value and loss on storage of vitamins A and D in five fish oils and fortified blends. After 8 months' storage at 50°–90° F. there was a loss in the vitamin D of 26 percent in herring oil and 19 percent in dogfish-liver oil. There was no loss in the vitamin D potency of pilchard, pink-salmon, or sockeye-salmon waste oils. There was no appreciable loss in the vitamin A potency during storage.

Specificity of the epiphyseal cartilage test for the pituitary growth hormone, W. MARX, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 4, pp. 250–252*).—Employing methods for testing the pituitary growth hormone on the epiphyseal cartilage (E. S. R., 89, p. 103), thyroxine, thyrotropic hormone, adrenocorticotropic hormone, and lactogenic hormone were shown to cause slight changes in cartilage thickness, whereas the thickness of proximal epiphyseal cartilage of the tibia was greatly increased by pituitary growth hormone, thus showing its specific effect in this test.

Some aspects of solar radiation in its relation to cattle in South Africa and Europe, G. RIEMERSCHMID (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 18 (1943), No. 1–2, pp. 327–353, illus. 6*).—A comparison of solar radiation of cattle in South Africa and Europe, judged by reflection measurements of two brown cattle hides, showed that the cattle absorb nearly three times as much heat from radiation as they produce by metabolism. In shade the amount of heat absorbed by the hairy coat may be reduced to 30–40 percent of the amount absorbed by the cattle on open range.

Benmore area location of range beef cattle investigations, R. H. WALKER. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 2, pp. 6–7, illus. 2*).—A description of these investigations.

Wartime beef production, F. C. FRANCIS, S. BULL, and W. E. CARROLL (*Illinois Sta. Bul. 501 (1944), pp. 127–139+, illus. 7*).—In two experiments, lots of 10 each of choice, good, medium, and common steers were full fed on corn and red clover hay to a good finish. Soybean meal was also fed in one experiment. In both experiments, second lots of choice feeder steers were finished in the choice grade, and in one experiment a second lot of good steers were finished as choice animals. In general, the better-grade steer yields more and better beef and has a higher dressing percentage; it is fatter than the poorer grade, but the fatter the animal the more corn is required to produce a pound of gain. Very fat beef is both uneconomical to produce and wasteful to the consumer because of the surplus of fat trimmed. To make a grain-saving program most effective, the animal should be grown to a weight of 700–800 lb. on roughages and pasture before fattening. The cutting yields of the

carcasses and the amounts of feed consumed largely confirmed these conclusions. Feeding choice, good, and medium feeders to a good finish increased the carcass beef yielded by these cattle an average of 45 percent more than that produced if the cattle were slaughtered without fattening. Choice finish was definitely too high, and common feeders should be given no more than "medium" finish. Feeding also insures an even beef supply.

Good quality beef produced with wartime feeds in steer fattening tests at station, W. E. CONNELL and R. C. TOM (*Colo. Farm Bul.* [*Colorado Sta.*], *6 (1944), No. 3, pp. 3–4, illus. 3*).—In comparisons of low grain rations with alfalfa hay, corn silage estimated at 100 percent showed replacement values of 69 percent for alfalfa silage, 78 percent for wet beet pulp, and 111 percent for beet-top silage. The largest daily gains were made by steers on dried beet tops, grain, and alfalfa. Dried beet pulp fed as part of the concentrate proved to be about the same replacement value as ground corn.

Beef produced satisfactorily from eastern pastures, J. I. MILLER (*Farm Res.* [*New York State and Cornell Stas.*], *10 (1944), No. 3, pp. 9, 13, illus. 1*).—A lot of good to choice Hereford steers averaging 630 lb. gained 182 lb. per head in 132 days on an average of about 1 acre per head of well-improved pasture. The steers produced carcasses grading "low-good," and the beef was readily acceptable to the local beef trade. Another lot pastured for 69 days, followed by 85 days' feeding on a fattening ration, gained an average of 256 lb., and the steers and their carcasses graded "top-good." A third lot, on good pasture for 112 days with ground corn ad libitum, gained an average of 236 lb. per head and graded "low-choice." The remaining lot, fed a dry-lot ration without pasture, produced the highest grade of beef and gained an average of 230 lb. per steer, but the grass-fattened steers made the highest net returns. The feeding of grain throughout the grazing season seemed most feasible where there was a limited area for grazing.

Summer-rainfall pastures and the cattle industries, C. S. CHRISTIAN (*Jour. Austral. Inst. Agr. Sci., 10 (1944), No. 1, pp. 25–30, illus. 1*).—Pastures resulting from summer rainfall made an important contribution to the production of beef for the Australian export trade.

Kudzu used as temporary pasturage, H. W. BENNETT and S. P. CROCKETT (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 6, pp. 1, 2, illus. 1*).—An average of 2.75 lb. of beef per day was produced from June 4 to July 2 by 23 cows, 7 calves, and 1 bull on 7 acres of kudzu pasture at the Natchez Branch Station. On the same pasture 6 heifers gained an average of 75 lb. from July 7 to August 27. The cattle were kept in good condition with kudzu grazing. In other studies, kudzu was found to have great value and to be useful for hay, temporary pasture, prevention of erosion, etc.

The use of urea in making silage from sweet sorghum, R. H. MEANS (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 5, p. 8*).—Beef cows wintered for 78 days on a daily ration of 35 lb. sorghum silage (treated with urea at ensiling at the rate of 10 lb. per ton) and 5 lb. Johnson grass hay maintained their weight, but a similar lot of 15 cows wintered on the same amount of untreated sorgum silage and Johnson grass hay lost an average of 47 lb. The urea-treated silage was more palatable, and chemical analyses showed that it contained 50 percent more carotene than untreated silage. In a subsequent test with 3 lots of 10 cows and 3 of 10 heifers each, those receiving sorghum silage treated with urea maintained their weight better or made slight gains as contrasted with larger losses produced by those receiving untreated silage. The treated silage was more palatable than untreated silage for calves. Considerable variability was apparent in the carotene content, but the treated silage was generally higher in protein than the untreated samples.

Cattle fattening project, 1943–44, E. B. Stanley and R. McCall (*Arizona Sta. Mimeog. Rpt. 65 (1944), pp. 3+*).—Seven lots of mostly ten 2-year-old steers each were fed to finish after 62 and 93 days on rations of wheat or barley, cottonseed meal, hegari silage, alfalfa hay, and salt. No significant differences were recorded for wheat and barley in the amounts of gain produced, dressing percentages, and grade on foot and in the carcass. Steam-rolled barley or wheat was only slightly superior to ground barley or wheat. The calculated profits per steer were smaller with cut-back and light-weight steers than with the rest of the individuals.

Wintering steer calves in the Nebraska sandhills, E. M. Brouse (*Nebraska Sta. Bul. 357 (1944), pp. 29*).—Comparisons were made of the gains of lots of 10 Hereford calves each, receiving rations of prairie hay with daily supplements of 0, 0.5, 0.75, and 1 lb. of cottonseed cake or other concentrates. In 5 yr. prairie hay alone as hay and pasture produced an average winter and summer gain of 284 lb. When 0.75 lb. of the cottonseed cake was included per day with the winter ration, gains were not as efficient per unit of cake as with the addition of 0.5 lb. of cake, and the yearlings would have to sell higher to pay for the additional feed cost. Feeding 0.5 or 0.75 lb. of cottonseed cake daily as a winter supplement resulted in 61 and 77 percent, respectively, of the combined winter and summer gains produced by feeding 1 lb. of cottonseed cake per head daily. Two lb. of small grain as a winter supplement produced approximately as much total gain as 0.75 lb. of cottonseed cake, but 2 lb. of shelled corn produced 33 lb. less gain. A combination of 1 lb. of corn plus 0.5 lb. cottonseed cake produced 7 lb. less total gain than 0.75 lb. cottonseed cake. However, 1 lb. of oats plus 0.5 lb. of cottonseed cake produced 16 lb., and a similar combination of rye and cottonseed cake produced 28 lb., more gain than 0.75 lb. of cottonseed cake. There were produced 80 and 90 percent as much total gain, respectively, by commercial pellets containing 12 and 22 percent protein as with cottonseed cake used as the winter supplement. Additions of 4.5 lb. of alfalfa hay per day to prairie hay ad libitum produced gains equivalent to those produced by 0.75 lb. of cottonseed cake. Hay consumption was increased and gains were 88 lb. greater. Feeding alfalfa hay ad libitum increased gains, but with the higher cost it usually was unprofitable as the sole roughage for wintering calves. Mixed clover hay was equivalent to feeding 0.75 lb. cottonseed cake as a supplement to prairie hay. Marked benefit was obtained from feeding minerals (steamed bone meal, limestone, and salt) with soybean meal, but there was no significant benefit from feeding minerals with 1 lb. of cottonseed cake.

Quality feed essential for calves, W. C. Cowsert (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 6, p. 2*).—General directions for and the importance of feeding good quality milk products supplemented with good quality concentrates and roughages to calves.

Cottonseed cake, meal, for finishing calves, R. H. Means (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 6, pp. 1, 2*).—Calves averaging 470 lb. in live weight were fed over 11 lb. of cottonseed cake per day for 148 days without unfavorable reactions in health. The calves made average daily gains of 1.78 lb. on this ration with alfalfa hay and sorghum silage. Only 10 lb. of cottonseed meal was consumed per head daily when substituted for the cottonseed cake, and the gains were 1.61 lb. Calves fed corn in addition to the cake and meal made average daily gains of 2.16 and 2.13 lb., respectively.

Nutritional anaemia of sheep on granite pastures of New England: Experiments with mineral licks, W. L. Hindmarsh (*Agr. Gaz. N. S. Wales, 55 (1944), No. 3, pp. 123–126*).—The administration of various minerals and salts in several years to sheep on pasture had no appreciable effect on the health, condition, or wool production. Evidently the sheep do not lack any specific mineral.

Fattening range lambs on South Dakota feeds, I. B. and L. E. Johnson. (Coop. U. S. D. A.). (*South Dakota Sta. Bul. 373 (1944), pp. 20, illus. 8*).—Sixteen years' results are reported of feeding lambs on farm grains and roughages with and without protein supplements and with and without beet byproducts at the U. S. D. A. Belle Fourche Field Station. The feeding experiments were made with lots of usually 100 lambs each, ranging in weight from 60 to 70 lb. at the start. The length of the feeding periods ranged from 97 to 160 days, with the finished weights averaging 97 lb. The average daily gain of 0.28 lb. with corn and alfalfa hay was slightly better and the profit slightly superior to barley and alfalfa. The returns per lamb were increased by the addition of pressed beet pulp and beet tops to the concentrates of corn. barley, wheat, and oats fed with alfalfa hay rations. Cottonseed cake added as a protein supplement to the grain rations with alfalfa hay increased the profits, but when included with pressed beet pulp and alfalfa hay the profits were reduced. Beet molasses was profitable in some combinations but reduced profits in others, and, therefore, regular feeding cannot be recommended. Minerals were not beneficial when alfalfa hay was fed. "Lambs that were one grade above average as feeders were one-half grade above average when fat, and their carcasses were one-third grade above average. Lambs that were one grade below average as feeders were only one-half grade below average when fat and their carcasses were only one-third grade below average."

Pulp-fed lambs bring greatest net return results of lamb fattening tests indicate, A. L. Esplin and R. C. Tom (*Colo. Farm Bul.* [*Colorado Sta.*], *6 (1944), No. 3, pp. 4–5*).—In lamb-fattening trials, the highest daily gains were made with a hand-fed cut mixture of 6 parts of ground corn and 1 part of chopped alfalfa hay, with self-fed chopped alfalfa hay. In carcass grade in which this mixture was the best of the group of the rations fed, there were 19 choice and 1 good carcasses. This group was second high on dressing percentage. Good but costly gains were produced with a self-fed mixture of 1 part ground corn and 2 parts chopped alfalfa hay. A grain mixture of barley, corn, and oats was only worth 77 percent as much as corn alone. Wet beet pulp was the most efficient of the three roughages—alfalfa silage, corn silage, and wet beet pulp silage—when fed with the grain mixture and good alfalfa hay. Alfalfa silage was calculated as having 88 percent of the value of corn silage. The least efficient ration in the test was the grain mixture fed with ground alfalfa and no succulent roughage, and the carcasses ranked low in dressing percentage.

Palatability and feeding value of different corns for pigs, W. L. Robison (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 188–206, illus. 4*).—Some varieties of corn were preferred to others by pigs, but when they were fed separately as the only feed available, the gains of the pigs were as efficiently produced in some cases by the less palatable as by the more palatable varieties. A higher feeding value was consistently shown for the hard dent hybrid corn than for one that was not so hard; on the other hand, flint corn which was still harder produced a trifle less gain per unit of feed than standard dent hybrid varieties. The relative effectiveness of the flint corn decreased as the pigs became older. Drying hard dent hybrid corn to a summer dryness of 10.3 percent moisture did not lower its palatability, but its feeding value was reduced. Immature corn kept from molding by drying had a value per pound of dry matter equivalent to mature corn. The condition of moldy corn determined its feeding value. As the pigs became older, less supplement was required in relation to the corn consumed. These studies were conducted in three experiments with 6 or 7 lots of about 14 pigs in each on different types, maturity, and hardness of corn containing varying amounts of moisture from 11 to 30 percent.

Paresis in pigs in relation to nutritional deficiencies, J. H. Kellermann, K. C. A. Schulz, and A. D. Thomas (*Onderstepoort Jour. Vet. Sci. and Anim.*

Indus., 18 (1943), No. 1–2, pp. 225–262, illus. 27).—A form of paralysis occurring in young pigs on rations deficient in vitamin A and calcium is described. There was such a softening of the bones that within 80 days three of four pigs fractured their spines. Other pigs started on the same ration when somewhat older did not develop the extreme lesions of paralysis. A ration of skim milk and white corn was physiologically complete except that it was lower in calcium and vitamin A. Normal growth and good health resulted when yellow corn and bone meal replaced the white corn. Cod-liver oil brought about rapid recovery in most cases.

The effect of vitamin E on reproduction in dogs on milk diets, C. A. Elvehjem, J. E. Gonce, Jr., and G. W. Newell. (Wis. Expt. Sta.). (*Jour. Ped., 24 (1944), No. 4, pp. 436–441*).—Normal growth past weaning was induced in one pup from a bitch on boiled milk when the ration was supplemented with 40 mg. of α-tocopherol per week, although all pups of several bitches receiving up to 25 mg. of α-tocopherol per week died soon after birth. In another litter of four pups, three grew normally on mineralized evaporated milk with weekly supplements of 40 mg. of α-tocopherol, but the fourth pup developed muscular dystrophy, from which it recovered on raw whole milk.

Fat requirements of the hen, M. W. Taylor, F. P. Jeffrey, and W. C. Russell. (N. J. Expt. Stas.). (*Poultry Sci., 23 (1944), No. 2, pp. 155–157*).—Continuing this study (E. S. R., 85, p. 805), it seemed apparent that a reduction of the fat content of the total ration from 3.12 to 1.56 percent had no unfavorable effect on mortality, egg production, fertility and hatchability, or mortality of chicks during the first 3 weeks of life. The rations were made up of several natural feeds extracted to bring them to normal-fat, medium-fat, and low-fat rations. There were included 50 hens in each of the 3 lots from December 1942 to August 1943.

Studies on the digestibility coefficients and biological values of the proteins in poultry feeds, A. J. Macdonald and S. Bose (*Poultry Sci., 23 (1944), No. 2, pp. 135–141*).—The digestibility, ascertained with eight desi (a breed indigenous to India) and one Rhode Island Red × desi cockerels, of a basal mash when it included 5 percent peanut meal was 83.63 percent, 5.7 percent soybeans 85.38, and skim milk 86.51 percent. The biological value of the basal mash plus milk was significantly higher than that of the peanut and soybean mashes.

Pointers on conserving poultry feed while continuing to maintain high production, B. Alder (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 2, pp. 5, 7, illus. 2*).—General directions for improved management and practices to save feed.

Good pasturage saves feed and expense for poultry raisers, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 183–185*).—In a comparative study with 500 White Leghorn pullets, those on whole grain and good pasture without mash did as well and were equal in quality to those given the regular range ration with mash. The pullets on pasture were 2 weeks later in starting to lay. Rainfall may be a factor in pasture feeding.

Gross values of combinations of cottonseed meal, soybean oil meal, and herring fish meal, C. I. Draper and R. J. Evans. (Wash. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 3, pp. 189–192, illus. 1*).—In an experiment designed to determine the effect of supplementing cottonseed meal with herring fish meal and soybean meal in various ratios, a group of 1,100 day-old White Leghorn cockerels was fed the depletion ration of Heiman et al. (E. S. R., 82, p. 377) for 14 days. The negative control lot received the basal ration which had 8 percent protein, 1 percent calcium, and 0.7 percent phosphorus and was complete except for the quantity of protein. The other lots were supplemented with 3 percent crude protein from casein for the positive control and one or more of the protein feeds, which included cottonseed meal, soybean meal, and herring fish meal. The gross values of the protein supplements were calculated as the average gain of the groups over and above that

of the negative controls. This net gain per unit of supplementary protein was divided by the gain of the casein controls. Soybean meal alone had a higher gross value than any combination of soybean meal and cottonseed meal. The gross value of cottonseed meal alone was only 13.4 as contrasted with 65.9 for soybean meal. The chicks appeared listless and growth was very slow with cottonseed meal alone. The gross values of combinations increased as the amount of fish meal increased. Fish meal alone had a gross value of 92.5. Combinations of soybean meal and cottonseed meal and fish meal and cottonseed meal in equal parts gave gross values of 45.7 and 66.1, respectively. There appeared to be little supplementation between cottonseed meal and either soybean meal or fish meal. The test was conducted with 22 lots of 15 chicks each fed in duplicate.

Emergency substitutions for laying mash in the diet of White Leghorn pullets, C. S. PLATT. (N. J. Expt. Stas.). (*Poultry Sci., 23 (1944), No. 2, pp. 126–129*).—The substitution of wheat bran or a mixture of 100 lb. corn meal, 5 lb. superphosphate, 2 lb. limestone, and 1 lb. salt, and in a third group no mash, for a mash of cereals and animal and plant proteins and minerals, resulted in about 85 percent of the egg production of the group continued on the regular ration. In all 3 pens where changes in the mash feeding were made there was a drop in production for 12 days, which continued for another 6 days after changing the ration back. In another trial where the mash was replaced by cooked soybeans, production took a decided drop after 6 days. A promising substitution involved making a mash mixture of 100 lb. of the regular mash, 100 lb. yellow corn meal, 5 lb. superphosphate, 2 lb. limestone flour, and 1 lb. salt proved quite effective during a 24-day period. In another trial it appeared that mash might be entirely removed from the ration for 6 days without serious loss. In a fourth trial a mineral mixture of 7 lb. superphosphate, 2 lb. calcite flour, and 1 lb. salt was mixed with cooked soybeans with some success in maintaining production. In another test removal of mash for 6 days did not result in an abnormal drop in production. When the mash was removed for over a month, production dropped very low, but there was little change when soybeans and minerals or the mash was diluted with corn meal and minerals.

Crab meal in poultry rations.—III, Laying and breeding rations, R. T. PARKHURST, M. S. GUTOWSKA, and C. R. FELLERS. (Mass. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 2, pp. 118–125, illus.* 1).—In two experiments crab meal proved as satisfactory a protein concentrate for egg production as for growth (E. S. R., 91, p. 64). It was equal to fish meal if adjustments were made for minerals and if other proteins were available. The replacements were on an equal protein basis, 4 lb. of crab meal equaling 2.5 lb. of fish meal. Egg production was generally maintained between 50 and 60 percent, with proteins provided by fish meal, crab meal, fermentation solubles and fish meal or crab meal, dried distillers' solubles and fish meal or crab meal, or dried skim milk with fish meal or crab meal, in addition to the proteins in the feeds of all lots, which included wheat bran, ground oats, alfalfa meal, and soybean meal. There should be assured an adequate intake of the factors in the B complex for maximum hatchability. The crab meal has given such excellent livability and hatchability that it may contain some factors to make it especially valuable in laying and breeding rations. The first of these experiments was conducted with 2 lots of 48 hens each for 12 lunar mo. and the second with 8 lots of about 10 hens for 6 lunar mo., giving special attention to hatchability.

The value of grass clippings silage for the growing chick, M. W. TAYLOR, W. C. RUSSELL, and C. S. PLATT. (N. J. Expt. Stas.). (*Poultry Sci., 23 (1944), No. 3, pp. 213–216*).—Normal growth in chicks was produced on a basal ration of yellow corn meal 40.3 percent, wheat-flour middlings 25, wheat bran 10, pulverized oats 8.3, soybean meal 7.5, meat scrap 3, and fish meal 3, with minerals and cod-liver oil, but 50 percent of the chicks showed curled-toe paralysis at 4 weeks of age.

When the ration was further supplemented with 5 percent grass-clippings silage, supplying 300 μg. of riboflavin per pound, curled-toe paralysis was reduced to 15 percent. There was no curled-toe paralysis when 5 percent dried skim milk was included in the ration, but in a second experiment the average weights of cockerels at 8 weeks of age receiving 3.6 percent casein with grass-clippings silage was 693 ± 14.0 gm. as contrasted with nearly 800 gm. for lots receiving riboflavin with the silage or casein, skim milk, or alfalfa meal. The study was conducted in two experiments with lots of 14–16 chicks. It was concluded that the grass-clippings silage was a good source of protein, carotene, riboflavin, and possibly other factors, but it was not eaten in sufficient quantities by the chicks, especially during the first 2 weeks, to be considered an important source of these factors.

Feed, don't waste, by-product incubator eggs, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 186–187*).—In one experiment 5.5 ct. was realized per pound of cooked incubator eggs used in supplementing a complex ration for pullets and cockerels. The feeding of 155 lb. of cooked unhatched incubator eggs produced 14 lb. more weight increases and made possible a saving of 131.5 lb. of mash. The calculated value of the unhatched incubator eggs would have been greater had the 5 percent dried skim milk not been included. The infertile unhatched eggs were boiled 30–45 min. before feeding, to avoid disease transmission, and passed through a meat chopper. The eggs should not be kept more than 1–2 weeks after cooking. There were 80 birds each of both sexes in the control and experimental lots, fed for 10 weeks.

The starting of chicks on grain and its effect in preventing "pasting up" at various controlled temperatures, L. L. PETERSON (*Poultry Sci., 23 (1944), No. 2, pp. 101–104, illus. 3*).—In three experiments with 160, 160, and 180 chicks brooded in duplicate lots at different temperatures from 75° to 110° F., feeding cracked grain as the only feed during the first 2 days was found to have a protective value against pasting up on the fourth day of chicks receiving an all-starter chick mash. There was no added advantage for cracked grain feeding longer than 3 days.

The comparative biological value of crystalline riboflavin, alfalfa leaf meal, and lespedeza meals as sources of riboflavin for chicks, H. PATRICK and C. L. MORGAN. (S. C. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 2, pp. 142–145*).—In a series of trials of the comparative biological values of crystalline riboflavin, alfalfa leaf meal, Korean lespedeza meal, and sericea lespedeza meal as sources of riboflavin for growth of chicks, Korean lespedeza and crystalline riboflavin prevented paralysis. With supplements of sericea lespedeza and alfalfa leaf meal, sufficient to provide 240 μg. of riboflavin per 100 gm. of ration, 50 and 30 percent, respectively, of the chicks showed paralysis. Further experiments indicated that the riboflavin in alfalfa meal and sericea lespedeza was in unavailable as well as available forms. The chick is suggested for assay of riboflavin in feedstuffs.

Poor utilization of phosphorus in cereals and legumes by chicks for bone development, J. MCGINNIS, L. C. NORRIS, and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci., 23 (1944), No. 2, pp. 157–159*).—The poor utilization for bone formation of phosphorus of plant origin (E. S. R., 89, p. 351) was confirmed in two experiments with chicks. The phosphorus in cereals and legumes, chiefly in the form of phytin, was not as available for bone development in chicks, when no vitamin D was supplied in the diet, as the phosphorus in a purified ration which was chiefly in inorganic form. Bone development was improved with the addition of 20 units of vitamin D to a natural ration, but normal bone development was not obtained even when 320 units of vitamin D per 100 gm. were added. When 20 units of vitamin D were included in a purified ration, normal bone development was obtained. Almost normal bone development resulted from feeding the basal ration unsupplemented

with the D-activated animal sterol. In the presence of vitamin D the phosphorus in a purified form was much more efficiently utilized for bone development in the chick than the phosphorus of cereals and legumes. In the presence of vitamin D, phosphorus of a purified ration which was largely inorganic was much more efficiently utilized than the phosphorus of cereals and legumes, which was principally in the form of phytin. The presence of phytase in cereal products meant that the action could not be explained by a lack of this enzyme in the ration.

Soybean meal chick rations need no inorganic phosphorus supplements, E. P. SINGSEN and H. H. MITCHELL. (Univs. of Ill. and Conn.). (*Poultry Sci., 23 (1944), No. 2, pp. 152–153*).—It was shown that plant proteins may be used for growing chicks without recourse to supplementary inorganic phosphorus, provided unheated leafy material is incorporated in the ration or access to green or leafy forage is possible. A source of vitamin D should be available. At 8 weeks of age, 20 chicks averaged 634 gm. on rations containing dehydrated alfalfa leaf meal plus NaH_2PO_4, and only 603 gm. without the mineral. When field-cured alfalfa meal was included in the ration, with and without the mineral, the average weights were 618 and 615 gm., respectively. The field-cured alfalfa contained a greater concentration of phytase which was not destroyed by heating in the commercial dehydrated hay.

Influence of incandescent and of fluorescent lights on calcification in the chick, G. B. WILLGEROTH and J. C. FRITZ (*Poultry Sci., 23 (1944), No. 3, pp. 251–252*).—Exposure of chicks for 3 weeks to a 14-w. fluorescent tube produced calcification equal to that obtained from feeding 20 A. O. A. C. units of vitamin D from cod-liver oil per 100 gm. of ration. Thus fluorescent lights may interfere with vitamin D assays.

When and how to cull the laying flock, F. P. JEFFREY and C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 31 (1944), No. 4, pp. 4*).—Culling the flock by inspection before March 1 is recommended to save feed. During March each bird is handled individually and all diseased, injured, nonlaying, or abnormal birds are discarded. The greatest profit was obtained over a year in 736 hens culled monthy starting in March, and the least profit from birds culled monthly throughout the laying year, whereas intermediate results were obtained with no culling. The characteristics for culling layers and nonlayers are presented. It seems doubtful whether a system of year-round hatching can be recommended in a feed-saving program because of the extra amount of feed consumed by the large number of replacement pullets.

Acid soluble phosphorus in the developing hen's egg, O. E. KUGLER. (Univ. Ill.). (*Jour. Cell. and Compar. Physiol., 23 (1944), No. 2, pp. 69–75, illus. 3*).—Analysis of the acid-soluble phosphorus at different stages of development in fertile hen's eggs showed that as a whole little was found until midway in the incubation period. It was not until the last week of incubation that there was evidence that the acid-soluble phosphorus in the yolk was proportional to the wet weight of the yolk. The wet weight of the embryos and their membranes increased at a faster rate than the acid-soluble phosphorus during the first 9 days of incubation, but thereafter the opposite effect was found. The inorganic phosphorus doubled in percentage of the acid-soluble phosphorus from the fifth to the twentieth day.

Variability in egg weight in Rhode Island Reds, F. A. HAYS (*Massachusetts Sta. Bul. 411 (1944), pp. 16, illus. 3*).—Continuing previous studies showing that egg weight increased at a nearly constant rate from October through February, maximum egg weight in 6 yr. in six generations appeared in March, followed by a slight decline in April, dropping to a low summer level in May. The egg weight began to increase in June and continued through September, which approached the March high. A good time to evaluate the flock for egg size was in March, because

the maximum size was attained and the variability was least. A simple correlation of —0.3084 ± 0.0297 was found between the age at first egg and the annual variability in the weight of eggs laid by 423 hens. There was no correlation between winter clutch size and annual or March variability in egg weight. There was no relation of annual or March variability of egg weight to winter pause or broody instinct. No correlation was found between the persistency and annual variability in egg weight. Only about 4 percent of the March variability in egg weight was associated with variability in the length of the laying year in 586 of the hens. The first egg of a clutch was generally the heaviest, with decline in the weight occurring least with heavy producers. No correlation was found between mothers and daughters in March variability in egg weight, or between the variability of egg weight and body weight. Evidently there was a slight decline in egg weight after the second laying year, and the condition of the egg weight variability was hereditary.

Influence of avian pneumoencephalitis on subsequent egg quality, F. W. Lorenz and W. E. Newlon. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 3, pp. 193–198*).—About 4 percent of 4,000 eggs from three ranches where the birds had previously shown symptoms of pneumoencephalitis showed bubbly eggs. A large number of bubbly eggs had perfect shells, but an association was later found to exist between them. About 12 percent of the shells of bubbly eggs were checked or cracked. In a total of 1,294 eggs laid by 92 birds after the onset of the disease, 6.4 percent were bubbly. The bubbly eggs were produced by a limited number of hens; 80 percent by 8 of the 92 hens. The average rate of production was about the same in hens that laid only normal or some bubbly eggs. Among this group of eggs, 27 had both bubbles and abnormal shells. Bubbles were present in 56 eggs with normal shells. The average albumin height of the eggs was less for those laid after the disease occurred than before. Eggs of birds that produced some bubbly eggs but no abnormal shells had an average albumin height loss of 0.93 mm., whereas those from hens that produced some abnormal shells but no bubbles lost 1.20 mm. When the eggs showed abnormal shells and the bubbly condition, there was lost an average of 2.51 mm. However, none of these differences were statistically significant except the last.

Cooling of eggs as related to kind of case, filler, and flat, E. M. Funk. (Mo. Expt. Sta.). (*U. S. Egg and Poultry Mag., 50 (1944), No. 2, pp. 71–72, 89, illus. 9*).—Ordinarily eggs in cases change temperatures very slowly, and in this study eggs were packed in half-cases and stored in a household refrigerator at about 30° F. A thermocouple was placed near the center of the eggs, which showed that those in fiberboard cases cooled about as rapidly as those held in cottonwood cases. Cooling was slightly more rapid in perforated fiberboard than in regular cases. Perforated fillers slightly increased the rate of cooling. Eggs cased with filler flats and diamond flats cooled slightly more rapidly than when cased with regular filler and cup flats.

Oil-protected shell eggs, W. L. Mallmann and J. A. Davidson. (Mich. Expt. Sta.). (*U. S. Egg and Poultry Mag., 50 (1944), Nos. 3, pp. 113–115, 133; 4, pp. 169–171, 189–191*).—Bacteriological tests showed that when eggs were produced under unfavorable conditions of temperature and humidity, nearly every egg was contaminated. Bacteriological study of storage eggs showed that eggs from the receiving station had a much higher count than those stored when 24 hr. old. It was concluded that bacterial invasion occurred largely before storage. Oil treatment of the eggs reduced moisture loss during storage at 31°, 68°, and 98° F., and reduced but did not entirely prevent decomposition and mold growth in eggs stored for 20 days to 7 mo. Pentachlorophenol (0.1 percent) did not stop mold formation entirely. Chemical methods failed to detect the presence of pentachlorophenol in eggs treated with 0.25-percent concentrations. Evidently the oil, with anti-

biotic agents, remains on the shell surface. Eggs treated with 0.1 to 5 percent of this antibiotic agent in oil were stored for 6–14 mo. without spoilage when the eggs were less than 48 hr. old when treated. The break-down due to physiological conditions as observed in organoleptic tests was approximately the same in eggs treated with oil alone or oil containing pentachlorophenol. The bacteriological content of the stored eggs treated within 48 hr. of laying was much lower in treated regular market eggs.

Farm preservation of egg quality, W. L. Mallmann and J. A. Davidson (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 309–312, illus. 1*).—Essentially noted above.

Vegetable protein diets for turkeys, J. C. Hammond, S. K. Haynes, S. J. Marsden, and H. W. Titus. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 2, pp. 105–109*).—Sixteen lots of 40 Beltsville Small White turkeys each were raised in confinement in duplicate from 1 day to 28 weeks of age on eight mash rations with grain feeding free choice after 8 weeks. Approximately equal quantities of protein, vitamins, and minerals, but from different sources, were provided in the mash. The control mash contained 7 percent dried skim milk, 7 percent meat scrap, and 14 percent fish meal, with other mashes containing chiefly soybean meal or soybean meal and peanut meal as protein supplements. The most rapid growth to 6 weeks of age occurred with a simple ration of wheat, soybean meal, and alfalfa meal. However, after 6 weeks the types of rations used did not affect the weights significantly. Vegetable proteins, of which soybean meal was a chief source, produced as large turkeys as the control ration. There were no significant differences in the average efficiencies of feed utilization or protein utilization in the eight rations in the 28-week feeding period. Neither fat grade of the carcasses nor feather grade was significantly influenced by the ration.

The role of riboflavin in turkey poult nutrition, H. Patrick, M. I. Darrow, and C. L. Morgan. (S. C. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 2, pp. 146–148*).—The turkey poult requires about 270 μg. of riboflavin per 100 gm. of ration during the first 6 weeks of life The studies were conducted with 8 lots of 25 poults each receiving rations containing 180, 240, 270, 300, 330, 360, 390, and 420 μg. of riboflavin per 100 gm. of the ration. Practically no mortality occurred when the rations contained more than 240 μg. of riboflavin. The riboflavin deficiency was characterized by retarded growth, high mortality, and inefficient feed utilization. A biotin deficiency resulted in perosis, dermatitis, and increased mortality. Perosis may accompany riboflavin deficiency.

DAIRY FARMING—DAIRYING

Comparison of molasses-oat silage and phosphoric acid-oat silage as feeds for the milking cow, W. A. King (*New Jersey Stas. Bul. 708 (1944), pp. 22*).—In a comparison of molasses- and phosphoric acid-oat silages, similar results to those found between molasses- and phosphoric acid-alfalfa silages (E. S. R., 89, p. 354) were observed. The molasses-oat silage was most economical when fed alone in terms of pounds of 4 percent fat-corrected milk produced per pound of total digestible nutrients. The molasses-oat silage was superior to corn silage and phosphoric acid silage, and it was more palatable than the phosphoric acid silage when fed alone, even with bicarbonate of soda or limestone as a neutralizer. There was little difference in palatability when 2 percent limestone was included with the phosphoric acid silage and both were included with hay and grain. The phosphoric acid silage caused a distinct acid condition in milking cows receiving the silages containing 20 lb. of phosphoric acid per ton of green material, and a decrease in silage consumption occurred. Increased consumption followed adequate neutralization. The digestibility of the protein was higher in phosphoric acid-oat

silage than in molasses silage, but otherwise there were small differences in digestibility. In nitrogen balance trials cows receiving phosphoric acid-oat silage rations excreted in the urine 10 percent more nitrogen in percentage of intake than on the molasses-oat silage ration. In the conduct of the study three groups of five cows each were running continuously for 18 weeks on rations of corn, molasses-oat, and phosphoric acid-oat silages with determination of milk production, feed consumption, digestibility, and nitrogen, phosphorus, and calcium balances. Other groups of three cows each were fed for 11 weeks in the comparisons of molasses-oat and phosphoric acid-oat silages fed alone. There was a negative phosphorus balance of 18.9 gm. per day when the cows received the phosphoric acid-oat silages with limestone, but a positive phosphorus balance was shown for cows receiving molasses-oat silage rations and phosphoric acid-oat silage rations supplemented with hay and grain.

The effect of complete evacuation of the mammary gland by Pitocin upon milk and fat production, C. B. KNODT and W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 6, pp. 449–457, illus. 5*).—The downward trend of lactation of five Holstein cows was checked by complete evacuation of the mammary gland with 1 cc. of Pitocin injected into the jugular vein (E. S. R., 85, p. 392). In all but one case, the Pitocin injections caused a significant increase in the amount of milk produced, either when the control period of 14 days preceded or followed the injection periods. Indications were that the fat percentage was also increased, but these effects were not so conclusive. Studies of gland evacuation by Pitocin administration with three cows more or less erratic in milking habits indicated that the lack of persistency was in many cases due to the incomplete letdown of milk. The retention of milk in the gland had a depressing effect on subsequent production.

The effect of thyroidectomy on lactation in the bovine, A. A. SPIELMAN, W. E. PETERSEN, and J. B. FITCH. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 6, pp. 441–448, illus. 4*).—The effects of complete and incomplete thyroidectomy at different ages on milk and fat yield and milk composition of four Holstein cows were investigated. Thyroidectomy preceding gestation, during pregnancy, or during lactation caused a complete cessation of lactation in about 180 days. Incomplete removal of the thyroid caused a temporary decline in secretion, followed by a gradual return to normal levels. The composition of the milk was not affected. The thyroid deficiency of thyroidectomy caused the reduction in lactation.

A simplified method of estimating 305-day lactation production, W. J. TYLER and A. B. CHAPMAN. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 6, pp. 463–469*).—High correlations were obtained between simplified and actual 305-day milk records of 241 and butterfat records of 257 lactations of cows in 2 Wisconsin Department of Public Welfare and D. H. I. A. herds. The close similarity of the intraherd repeatability figures and mean yields for milk and butterfat production indicate no important differences between the simplified and centered schemes, involving multiplication of the first 10 testing-day values by 30.5.

The action of the mechanical milker in relation to completeness of milking and udder injury, W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 6, pp. 433–440, illus. 2*).—In the technic devised, the excised mammary gland was suspended by hooks in the median suspensory ligament and lateral facia in approximately the normal position. Skim milk was infused by gravity, and observations were made on the effects of mechanical milking on variations in the thoroughness of milking operations. There was no detectable vacuum created in the teat sinus when the milk flowed freely from the gland sinus into the teat. Teat cups crawled upward as intraglandular pressure was sufficiently reduced so that the tissues became more flacid and they caused a complete closure

of the teat and gland sinuses, thus accounting for incomplete milking. Complete evacuation of all milk in the gland was found to be possible by tugging on the teat cup when it begins to crawl and closes the passage between the teat and gland sinuses. Closure of the passage between these sinuses is postulated as having a traumatizing action on the sinuses, and such injury predisposes to mastitis. Pressure bulbs in the hand of the milker showed that greater force was frequently applied to the teat by hand milking than by machine milking. It is concluded that a mechanical milker properly operated and removed when milking is complete is less likely to cause injury to the teat and udder than hand milking.

Farm dairy utensils washed effectively by new methods, J. M. Jensen (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 277–282, illus. 2*).—Wetting agents, a type of detergent very effective in removing "milk soil" from metal and rubber parts of dairy utensils, cause reduction in surface tension of the washing solution, thereby producing a rapid penetration, softening of the milk film, and better contact of the washing solution with the surface to be cleaned. Although possessing many advantages, wetting agents used alone in hard water were not completely satisfactory. Under certain conditions, the water and wetting agents become cloudy from precipitation of calcium and magnesium salts. Sodium hexametaphosphate with a pH near normal milk completely eliminates cloudiness. The protein is more easily removed through the detergency of the wetting agent. One tablespoonful of sodium hexametaphosphate to 3 gal. of water gave excellent results for washing milking machines and separators. The amount of sodium hexametaphosphate required to soften water may be based on 1.25 oz. of hexametaphosphate per grain of hardness. The nonalkaline character of the washing solution makes rinsing unnecessary, and it has a minimum of corrosion effect. Directions are given for washing the milking machine and separator.

Prevention of milkstone formation in a high-temperature-short-time heater by preheating milk, skim milk, and whey, R. W. Bell and C. F. Sanders. (U. S. D. A.). (*Jour. Dairy Sci., 27 (1944), No. 6, pp. 499–504, illus. 3*).—As the preheating temperature of milk, skim milk, and whey (E. S. R., 87, p. 709) was increased, the rate at which the tubing became coated with solids decreased until, with a preheating temperature of 95° C. and a holding period of 10 min., the rate was very slow. Milkstone formation was faster except when the preheating temperature was below 70° or above 90°. It seems that the formation of milkstone in a high-temperature-short-time heater can be practically prevented by suitable preheating.

Influence of bacteria, yeast, and leucocyte distribution in bottled homogenized milk on sediment formation, G. M. Trout, M. V. Scheid, I. I. Peters, and W. L. Mallmann (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 285–296, illus. 3*).—Samples of bottled nonhomogenized milk showed that the great majority of the bacteria were in the upper portion, but in homogenized milk there was little difference in the bacterial count of different portions, and little or no shaking seemed necessary for accurately determining bacterial counts. Yeast cells in nonhomogenized milk both tended to rise with the fat and to settle out so that the yeast count in the middle portion was considerably lower than in the upper or lower portions. In homogenized milk the settling continued, but since the fat failed to rise it did not carry yeast cells up. The leucocytes follow the same trend as bacteria in nonhomogenized milk, being most prevalent in the upper portion of the milk, but in homogenized milk leucocytes follow the trend of the yeast cells, the preponderance being found in the lower portion. Of the three—bacteria, leucocytes, and yeast cells—leucocytes played the major role in sedimentation of homogenized milk, but sediment was not due entirely to leucocytes, since it was demonstrated in nonhomogenized milk containing few leucocytes when there were added

quantities of unwashed separator slime. Sediment was noted in homogenized milk to which was added 1 gm. of separator slime per quart. After 48 hr. at 40° F. the lower portion of the homogenized milk averaged nearly 2,000,000 leucocytes per cubic centimeter.

Pasteurisation, H. HILL (*London: H. K. Lewis & Co., 1943, pp. 152+*).—Pasteurization of milk as a means of safeguarding human health is described. The needs and the practices followed in the manufacture and treatment of dairy products are emphasized.

Factors affecting the quality of southern short cure Cheddar cheese, F. E. HANSON, W. S. ARBUCKLE, and C. N. SHEPARDSON (*Texas Sta. Bul. 646 (1944), pp. 30, illus. 3*).—In preliminary investigations of the effect of several conditions on Cheddar cheese manufacture, lots of cheese ripened for 11 weeks at 50° F. after coagulation with 3 oz. of rennet per 1,000 lb. of milk were of higher quality than when the milk was coagulated with three times as much rennet. A bitter flavor and sticky body occurred with the additional rennet. After ripening the cheese for 10 weeks, lots containing 2 lb. of salt per 1,000 lb. of milk were flat in flavor, whereas lots with 3.5 lb. of salt added per 1,000 lb. of milk were salty in flavor and hard in body. When six lots were manufactured by the stirred method, they were bitter in flavor but slightly inferior in body to six lots made by the Cheddar cheese method. The body of the stirred curd cheese was short and that of the Cheddar cheese was softer and smoother. In general stirred cheese was slightly inferior to the Cheddar type of cheese, but further studies seem warranted because of the superior flavor development of stirred curd cheese.

In studies of the effect of ripening temperatures, it was found that the flavor score of three cheeses ripened at 70° was medium full and better than that of three comparable cheeses held at 50° for 7 weeks, but the body of the cheese held at the higher temperature was inferior. In 10 trials, washed curd cheese was superior in body and flavor to unwashed curd cheese when ripened at 50° and at 70°. Information on the effect of 34 ripening processes was furnished by employing temperatures of 45°, 60°, 70° and 80° for ripening of 2, 4, 6, 8, and 16 weeks or for different temperatures for different parts of the time. Rennet extract was added as 2, 4, and 8 oz. per 1,000 lb. of milk. Observation was made on the flavor, body, and texture at different intervals. In studies of the effect of acidity and washing treatment, lots of curd were prepared, one-half with pH 5.0 and the other half with a pH of 5.5. After milling a portion, the curd was washed with cold water. A second portion was pasteurized and cooled to 90°. The third lot was untreated and served as a control.

Of the several treatments used in the preliminary trials, variations in ripening temperature had the most influence on the quality of the product. The pH of the cheese increased slightly with age, but the temperature of curing seemed to have little effect on the rate of change. It seems doubtful if the higher temperature of ripening affects the quality or rate of curing of the cheese, although the moisture is reduced and the body firmness increased. Probably the best cheese was ripened for 8 weeks at 60° and 8 weeks at 45°. At other temperatures the flavor, body, and total score increased as ripening time was prolonged, especially the body score. Cheese held at 70° or 80° ripened very fast, but lower flavor developed in cheese held at 80° for any length of time. The best ripening treatment for highest quality short cure cheese in 4 weeks was 2 weeks at 45° followed by 2 weeks at 60°. The most desirable temperatures for other periods were indicated. The rate of production of water-soluble nitrogen and water-soluble nitrogen not precipitated by trichloroacetic acid was very similar. The rate of hydrolysis of cheese held at 45° throughout 16 weeks was more uniform, but at the higher temperatures uniform hydrolysis occurred for the first 4 weeks, after which the rate increased. With 8

oz. of rennet per 1,000 lb. of milk, the cheese was superior in flavor and condition of ripening, but the body was weak and sticky. With 4 oz. of rennet per 1,000 lb. of milk, the body and texture were superior. A slow-ripening cheese occurred at all temperatures with 2 oz. of rennet per 1,000 lb. of milk. In general, the rate of proteolysis was greater with the higher ripening temperatures and the greater amounts of rennet extract of 4 and 8 oz. per 1,000 lb. of milk.

Improving the quality of Swiss cheese by clarification of the milk, K. J. MATHESON, G. P. SANDERS, L. A. BURKEY, and J. F. CONE. (U. S. D. A.). (*Jour. Dairy Sci., 27 (1944), No. 6, pp. 483–498, illus. 2*).—In connection with the introduction of the clarifying process in the Swiss cheese industry in the United States, the effects of centrifugal clarification of cheese milk on the properties of the milk and on the quality and properties of cheese were studied in controlled experiments. Data were obtained on approximately 375 pairs of Swiss cheese. The most significant effect, besides the removal of the extraneous matter, was a pronounced decrease in number and increase in size and uniformity of the eyes, resulting in a distinct improvement in grade and market value of the cheese. Other effects on the cheese included increased growth of starter organisms, an increase in firmness of the curd, a decrease in moisture content and yield of cheese, and an increase in the fat loss in the whey. Other effects of clarification on the properties of the milk included a decrease in the tendency of the fat to aggregate, removal of a large proportion of the leucocytes from mastitis milk, an increase in the rate of growth of starter organisms, supression of undesirable gas-forming anaerobes, an increase in the ratio of O_2 to CO_2, and an increase in the rate at which the oxidation-reduction potential of the milk changed. The efficiency of the clarification process was decreased at decreased temperatures and with decreased speeds of the clarifier bowl.

Red mold on blue cheese, B. W. HAMMER and J. C. GILMAN. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 6, pp. 413–418, illus. 2*).—A red mold developing on the surface of blue cheese was isolated on a special cheese agar and named *Sporendonema casei.* Its growth on this cheese was inhibited by covering the cheese with petrolatum containing mold inhibitors, but it is suggested that a type of material firmer than petrolatum at curing-room temperature probably would be preferable.

Abnormal color production in coffee-evaporated milk mixtures with special reference to the role of lactic acid, I. A. GOULD (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 335–340, illus. 1*).—Various brands of freshly opened evaporated milk imparted the normal golden yellow color when added to coffee. Subsamples from the opened cans, transferred to glass flasks for storage in the refrigerator, also imparted normal color to coffee, but subsamples stored in the opened can imparted a grayish green color to coffee. With the latter samples, there was a general relationship between the degree of grayish green color production, the original lactic acid content of the milk, and the degree of rusting of the can above the milk level. Subsequent tests were conducted with stored samples that had been varied by the addition of different amounts of lactic acid with or without the addition of strips of metal cut from the evaporated milk cans. The results of these tests suggested that "the grayish green color in mixtures of evaporated milk and coffee is not due directly to the lactic acid content of the milk but appears to be the result of iron contamination. Under home conditions, in which evaporated milk is often held for prolonged periods in the refrigerator in opened cans, the rusting of the can may result in sufficient iron contamination of the milk to produce this color defect when the milk is used in coffee. When the grayish green color occurs in mixtures of coffee and evaporated milk, the flavor of the mixture is impaired."

Observations on the use of roller process sweet cream buttermilk powder in ice cream, E. L. Thomas and W. B. Combs. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 6, pp. 419–432, illus. 6*).—Neither the original viscosity nor the viscosity of aged mixes was significantly affected by the use of roller process sweet cream buttermilk powder in place of roller process skim milk powder as the source of milk solids-not-fat for ice cream manufacture. A greater rate of whipping was produced with the sweet cream buttermilk powder than with skim milk powder. When either cream or unsalted butter was used as a source of butterfat for the mix, usually 1–2 min. less time was required to obtain a normal overrun. Roller process sweet cream buttermilk powder resulted in a freshly frozen product which is drier in appearance and has more consistency than when skim milk powder is used. Mixes and ice cream made with skim milk powder and sweet cream buttermilk solids derived from buttermilk obtained from sweet cream testing either 25, 33, or 40 percent butterfat were compared in studies of the effects of overrun, time, and temperature and the flavor, body, and texture of the ice cream. Ice cream with buttermilk powder tended to have a richer flavor, less tendency toward the development of a cooked flavor, and a foamier melt-down than ice cream from roller process skim milk powder.

Changes in bacterial counts of stored ice cream mix, F. E. Nelson. (Kans. Expt. Sta.). (*Jour Dairy Sci., 27 (1944), No. 6, pp. 459–462*).—The bacterial count of ice cream mixes stored at 40° F. was shown to increase with time and temperature. With temperatures above 42° the increases were of particular significance. Increases of coliform organisms were particularly prominent above 46.4° but were small below 40°. The practice of storing mixes above 40° is undesirable. The storage of frozen rather than unfrozen mix is recommended.

VETERINARY MEDICINE

[Veterinary research in Canada] (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 5, pp. 123–127, 130–134*).—These articles include The Relationship of *S[almonella] pullorum* Infection to Omphalitis, by J. S. Glover (pp. 123–124); Caesarian Section and Torsion of the Uterus in Cows, by L. A. Gendreau (pp. 125–127); and Shipping Fever—I, Search for a Hypothetical Agent Associated with *Pasteurella,* by L. M. Heath and J. L. Byrne (pp. 130–134).

The in vitro effect of certain sulfonamides upon Brucella, G. Worley, Jr., G. Beal, and V. T. Schuhardt (*Jour. Bact., 47 (1944), No. 5, p. 453*).—"Using test solutions equivalent to 5.0, 2.5, and 1.0 mg. percent sulfanilamide, [the authors] found sulfathiazole, sulfadiazine, and sulfapyridine, all of approximately the same effectiveness, to exert the greatest inhibitory action against *Brucella.* Sulfamethyldiazine and 2-sulfanilamido-4, 6-dimethylpyrimidine were slightly inferior to the foregoing compounds, while the salts of the following were definitely inferior: Diasone, sulfathalidine, sulfacetamide, sulfanilamide, and N_1 butyryl sulfanilamide."

[Contributions on encephalomyelitis] (*Jour. Bact., 47 (1944), No. 5, pp. 463–464, 465–467*).—Abstracts of the following papers are included: Embryonic Chick Antigens for Complement Fixation With the Viruses of Eastern and Western Equine Encephalomyelitis, by G. C. Brown and T. Francis, Jr. (pp. 463–464); Studies on the Susceptibility of the White Rat and Hamster to St. Louis Encephalitis Virus, by F. B. Gordon (pp. 465–466); Neutralizing Antibody to Western Equine Encephalomyelitis Virus, by I. M. Morgan (p. 466); Interference Between Western (W.E.E.) and Eastern Equine Encephalomyelitis (E.E.E.) Viruses, by R. W. Schlesinger, P. K. Olitsky, and I. M. Morgan (pp. 466–467); and Studies in Passive Immunity Produced With Western Equine Encephalomyelitis Antiserum, by J. Zichis (p. 467).

Recent research in avian and simian malaria, R. I. Hewitt (*Jour. Natl. Malaria Soc., 3 (1944), No. 2, pp. 95–109*).—This is a review of research recently published in American and foreign journals.

Relaciones serológicas entre las bacterias del género Salmonella y las bacterias "fermentadoras lentas de lactosa" [Serological relations between bacteria of the genus Salmonella and bacteria slowly fermenting lactose], J. J. Monteverde (*Buenos Aires Univ., Rev. Facult. Agron. y Vet., 10 (1943), No. 3, pp. 370–421; Eng. abs., pp. 419–420; Portug. abs., p. 420*).—Detailed observations on 176 bacteria slowly fermenting lactose indicated that 54 presented serological connections when treated with serums prepared with bacteria of the *Salmonella* group, *S. coli* (Kauffmann), or the serological types described by Peluffo, Edwards, and Bruner (E. S. R., 88, p. 388).

The susceptibility of fur-bearing animals and game birds to tularaemia, J. H. Brown (*Canad. Field Nat., 58 (1944), No. 2, pp. 55–60*).—The purpose of this paper is to record the known facts in regard to the relationship of tularemia to fur-bearing animals and game birds, and to point out the situation as it now exists in Alberta.

Bloat in dairy cattle, T. M. Olson (*South Dakota Sta. Cir. 52 (1944), pp. 11, illus. 2*).—In connection with this discussion of the present status of research on this problem, pressures in the rumen obtained with a motor-driven compressor pump and even higher than the pressures in bloated cattle were reduced to normal by a single belch, and this afforded relief. However, when an animal was prevented from belching, as by mechanical obstruction by the ingesta, ruminal pressure soon exceeded the animal's endurance. In the cattle tested ruminal pressures were obtained in 16 insufflated animals of 50–120 mm. of mercury, in 15 dead bloated animals 40–125 mm., in 8 live bloated animals 50–70 mm., and in 2 which ruptured the diaphragms of dead animals 125 and 140 mm. Sheep anesthesized with nembutal died very suddenly when the pressure approached 80 mm., and the diaphragm was found to be ruptured.

Analyses of the ruminal gases in 59 normal and 23 bloated cows showed about the same composition except for higher hydrogen sulfide and lower methane in bloated animals. Tests with 4 cows showed a higher percentage of hydrogen sulfide in the ruminal gas after stable feeding of freshly cut alfalfa than on dry feed or pasture. Absence of bloat during 7 consecutive years of abnormally low rainfall on pasturing on either alfalfa or sweetclover as compared with serious bloating on grazing the same plats under normal rainfall is attributed to the more rapid growth of these legumes under heavier rainfall and a resulting higher sulfur content.

Various theories of bloat causation are discussed. As preventive measures the following suggestions are made: "Mix legumes with grasses such as brome, timothy, and redtop. Have good grass pastures available to the cows. Pasture Sudan grass. It provides excellent grazing for the summer months and will supplement the legume pasture. For early spring grazing, use rye and other cereal grains. They make good supplemental pasture. Feed grain and silage to cows on pasture."

The streptococcal flora of the non-mastitic udder, J. J. Reid, M. A. Farrell, E. A. Keyes, and J. F. Shigley. (Pa. State Col.). (*Jour. Bact., 47 (1944), No. 5, p. 440*).—β-Hemolytic streptococci of Lancefield group D were found in the milk of all of 25 cows selected from the few among 1,200 lactating cattle which showed no clinical evidence of udder trouble in monthly examinations over a period of 2 yr. In 22 of the 25 animals streptococci of other Lancefield groups were demonstrated.

Gangrenous mastitis in dairy cows, O. W. Schalm. (Univ. Calif.). (*Vet. Med., 39 (1944), No. 7, pp. 279–284, illus. 5*).—Observations on three herds are reported. In one of these *Corynebacterium pyogenes* was found to be the pre-

dominating organism in the exudates from three animals, but pure cultures isolated from these cases failed to induce gangrenous mastitis when injected into a normal udder. In another herd a violent form of gangrenous mastitis was produced in two lactating cows following injection of 2.5 to 5 cc. of pure broth cultures of strains of *Staphylococcus aureus* into the teat canal. Two dry udders receiving similar injections developed only a transitory mastitis. In conclusion, it is stated that "it is apparent that the etiology and the methods for the prevention and the treatment of gangrenous mastitis need further study. *S. aureus* has been given a place of primary importance, but it is not certain that other pathogens cannot serve as etiological agents. It is necessary, therefore, to make bacteriological study of many cases of the disease in order to establish more definitely the primary cause. Since *S. aureus* appears to be of importance, a thorough investigation of the entire staphylococcus problem as it pertains to mastitis is indicated."

The modified Whiteside test for bovine mastitis, J. M. MURPHY (*New Jersey Stas. Cir. 488 (1944), pp. [2], illus. 1*).—A brief description of the test and its interpretation.

Results of examination and treatment of mastitis in the ambulatory clinic, S. J. ROBERTS. (Cornell Univ.). (*Cornell Vet., 34 (1944), No. 2, pp. 131–140*).—This material is a description of practically all of the cases observed by the author in ambulatory clinic calls in a year. The results of the physical and bacteriological examinations of 198 quarters affected with mastitis are given. These cases generally occurred in small, commercial dairies. Staphylococci and unidentified "green" streptococci were more common as causes for mastitis than *Streptococcus agalactiae.* Many of these were acute mastitis cases secondary to injury.

The results are reported on the treatment of 130 quarters affected with mastitis by the use of intramammary infusions of acriflavine, tyrothricin, and sulfanilamide in oil.

Infusion of a quarter with one of the mastitis infusion agents is indicated following teat surgery or teat injury.

"Staphylococcic infections of the udder are stubborn and difficult to treat with our present intramammary infusions. The results of treatment of mastitis in veterinary practice with intramammary infusion of various agents [were] disappointing. The reasons for these poor results are discussed."

The prognosis and treatment of mastitis, S. D. JOHNSON. (Cornell Univ.). (*Cornell Vet., 34 (1944), No. 2, pp. 99–131*).—This paper deals mainly with the chemotherapy of bovine mastitis, including results from treatment with acriflavine, 5 percent silver oxide in oil, tyrothrycin, and sulfanilamide in oil. Mild acute and subacute cases were definitely improved by infusions of acriflavine and sulfanilamide in oil. Many mild cases of chronic mastitis caused by staphylococci, atypical types of streptococci, and a few cases due to coliform and "undetermined" bacteria, responded as favorably to treatment with infusion therapy as did mild cases due to *Streptococcus agalactiae.* The ratio of recoveries as determined by clinical evidence in "mild" cases was about 50 percent as compared to 25 percent in "severe" cases. Repeated treatments plus a long dry period would undoubtedly have improved these results. More quarters improved clinically than bacteriologically.

S. agalactiae was infrequently found in acute mastitis. Treatment of what are termed No. 4 udders seldom gave favorable results.

"All cases of mastitis should be treated until recovery is complete or until present methods prove ineffective. Unless the case is slight, more than one treatment is required. Many cases require treatment and rest for 1 yr. to obtain recovery.

"Dry udders respond to treatment better than lactating udders.

"Dairymen should be encouraged to maintain udder health through a rigid mastitis prevention and control program. This should include frequent examina-

tions of all cows in the herd, with reasonable segregation of infected animals, and withholding of abnormal milk from the supply. Treatment should be considered as a secondary part of the plan."

Mastitis control requires sanitation and treatment, C. S. Bryan (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 268–273*).—Experiences noted in six farmer-owned herds are reported as clearly demonstrating the need of an accurate diagnosis of mastitis and a determination of its cause before any udder infusion treatments are applied if good results are to be expected from their use. It is pointed out that the infusion treatments must be used in conjunction with a sanitary program of milking and handling the cows to eliminate the udder troubles caused by factors other than infection.

Bovine mastitis and milking practices, L. C. Moss (*North Amer. Vet., 25 (1944), No. 5, pp. 281–284, illus. 2*).—This discussion is based largely on observations in Hawaii and stresses the importance of careful milking and udder hygiene.

Mastitis in heifers following injury by the horn fly, Haematobia serrata Desv., D. A. Sanders. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 806, pp. 284–285, illus. 1*).—Observations conducted at one dairy demonstrated that controlling the hornfly population reduced the incidence of mastitis in first calf heifers to the extent that it no longer constituted a problem of economic importance. It is concluded that this fly was responsible for initiating mastitis infections in first calf heifers as encountered in the beef and dairy herds under observation.

El vacuno repositario del Trypanosoma equinum Voges, 1901 [Bovine repository of T. equinum Voges, 1901], R. J. Roveda (*Buenos Aires Univ., Rev. Facult. Agron. y Vet., 10 (1943), No. 3, pp. 530–535; Eng. abs., p. 535; Portug. abs., p. 535*).—As a result of these experiments it was learned that "the inoculation of *T. equinum* in cattle does not produce symptoms. Periodical examinations of the blood of infected cattle by means of Ross's thick blood drop method did not show the existence of the parasite. Nevertheless, this blood inoculated into guinea pigs in doses of 0.25 to 16 cc. revealed the presence of the parasite. Doses varying from 0.25 to 16 cc. did not modify the results, thus confirming existence of positive and negative cases of the infection." *Bos taurus* can be a 100-percent carrier of *T. equinum.* In these experiments the maximum time of this carrier state was 110 days and the minimum 53 days. Neither age nor sex modified the state of latent parasitism. "The experiments on reinfection produced a weak infection of short duration. There is probably a degree of immunity toward reinfections."

Sulfasuxidine and sulfathalidine for infectious calf scours, W. T. S. Thorp, V. J. Pisciotta, and C. B. Grundy. (Pa. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 806, pp. 274–278, illus. 2*).—Sulfasuxidine and sulfathalidine were used on 84 cases of infectious calf scours. These sulfonamides were found to be highly bacteriostatic for the coliform bacteria. The sulfathalidine was apparently more bacteriostatic than the sulfasuxidine when given in equal dosages. Toxicity studies were made upon 10 normal calves to determine the concentration of the drugs in the blood, urine, and feces. Two to four times the therapeutic dose of the sulfonamides was administered without evidence of toxicity. A histopathological study of the liver, spleen, and kidneys showed no tissue changes.

Pathologic changes in sheep resulting from exposure to low barometric pressures, J. W. Miller (*Pub. Health Rpts. [U. S.], 59 (1944), No. 19, pp. 618–620, illus. 3*).—Four pathologic conditions—air emboli, epicardial and endocardial hemorrhage, serious effusion, and contracted spleen—were consistently present in 12 sheep exposed to simulated altitudes from 31,000 to 46,000 ft.

Purulent encephalitis in sheep: "Pseudo sturdy," W. Lyle-Stewart and E. Gray (*Vet. Jour., 100 (1944), No. 2, pp. 32–35*).—Observations of this disease

were made on six flocks over a period of 10 yr. The clinical picture resembles that of "sturdy" or "gid," and is nearly always associated with an intense mucoid inflammation of the nasal chambers. The organism has not been identified. Recovered sheep are generally left with a wry neck.

Recent advances in the prevention and treatment of blowfly strike in sheep (*Austral. Council Sci. and Indus. Res. Bul. 174 (1943), pp. 20+, illus. 10*).—This is a supplement to Report No. 2 of the Joint Blowfly Committee (E. S. R., 84, p. 222). Special emphasis is laid on what is practical and most labor-saving for flock masters under present-day conditions, including an account of the modified Mules operation.

Phenothiazine salt mixtures in the control of parasitism, J. W. Britton, R. F. Miller, and H. S. Cameron. (Univ. Calif.). (*Cornell Vet., 33 (1943), No. 4, pp. 339–343*).—From tests with two bands of several thousand feeder lambs of the mixtures previously discussed (E. S. R., 89, p. 117), it is concluded that "phenothiazine and salt mixed at the rate of 1 to 15 is effective in controlling the common nematodes of sheep under California conditions. At this concentration the mixture is nontoxic when the animals are allowed free access to it over a period of 11 mo. The method is apparently not effective in cattle under similar conditions."

The practical application of anthelmintic medication of lambs, J. W. Britton and R. F. Miller. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 806, pp. 270–272*).—This is a comparison of a copper sulfate-nicotine sulfate mixture (cunic mixture), tetrachloroethylene, and phenothiazine in the control of parasitism of lambs on irrigated Ladino clover pastures. "There appears to be little doubt that 1 part of phenothiazine mixed with 10 parts of half-ground salt, kept in front of lambs at all times, most nearly approaches the ideal anthelmintic of any of the drugs or methods employed in this trial. It is nontoxic, easy to administer, cheap, and the most effective when judged by any known method of measuring anthelmintic effectiveness. Other forms of phenothiazine, except 8 gm. of phenothiazine powder, are more satisfactory than either cunic mixture or tretrachloroethylene. The pure phenothiazine powder in therapeutic doses (12 to 15 gm.) would undoubtedly give equally as satisfactory results as the drench or pellet forms of the drug."

Copper sulfate-nicotine sulfate solution and phenothiazine compared as anthelmintics for lambs, J. P. Willman and D. W. Baker. (Cornell Univ.). (*Cornell Vet., 33 (1943), No. 4, pp. 365–368*).—A comparison of these treatments was carried on during the summer and fall of 1942 with 84 grade lambs. Parasitological examination of the digestive tracts of 55 lambs showed no difference in the effectiveness of the two treatments for the control of the large stomach worm (*Haemonchus contortus*), but phenothiazine seemed more effective for thread-necked worms (*Nematodirus spathiger*) and medium-sized stomach worms (*Ostertagia circumcincta*).

Demodectic mange of the milk goat, A. J. Durant. (Mo. Expt. Sta.). (*Vet. Med., 39 (1944), No. 7, pp. 268–270, illus. 4*).—Observation of cases in Missouri and Connecticut indicated a condition similar to those reported in 1925 by Cram (E. S. R., 54, p. 478) and attributed to a mite designated as *Demodex folliculorum caprae*. In one animal 83 nodules were present. The disease is thought to spread slowly. Treatment was by cross incision of the nodules, thorough removal of their contents by a curette, injection of 10-percent carbolic acid solution, and painting the area with tincture of iodine.

Some diseases of white-tailed deer in Minnesota, R. Fenstermacher, O. W. Olsen, and B. S. Pomeroy. (Minn. Expt. Sta.). (*Cornell Vet., 33 (1943), No. 4, pp. 323–332, illus. 4*).—Data collected over a period of approximately 7 yr. are reported.

Diagnosis and control of some communicable swine diseases, R. M. Hofferd (*Cornell Vet., 34 (1944), No. 2, pp. 152–173*).—This is a discussion of hog cholera, swine erysipelas, acute septicemic *suipestifer* infection, infectious gastroenteritis, necrotic enteritis, swine dysentery, swine influenza, infectious pneumonia, swine pox, and streptococcic infections.

Studies on trichinosis.—XVI, Epidemiological considerations based on the examination for trichinae of 5,313 diaphragms from 189 hospitals in 37 States and the District of Columbia, W. H. Wright, L. Jacobs, and A. C. Walton (*Pub. Health Rpts. [U. S.], 59 (1944), No. 21, pp. 669–681*).—Evidence obtained from this survey "indicates very strikingly that within the continental limits of the United States exposure to trichinosis is nearly uniform in degree regardless of geographical or environmental factors. Such evidence, therefore, points to the need not for the enactment of control measures in localized areas but for the treatment of the problem on a Nation-wide basis either through concerted action on the part of the States or assumption of control by the Federal Government."

Ketosis in swine, J. Sampson, V. M. Hanawalt, and R. Graham. (Univ. Ill.). (*Cornell Vet., 33 (1943), No. 4, pp. 355–359*).—This report on a severe case of ketosis in a sow after farrowing is said to be the first in Illinois and to confirm the observations of Hull and Nolan (E. S. R., 83, p. 684). Blood and urine analyses during the attack and after recovery are included.

Phenothiazine poisoning in pigs, J. W. Britton. (Univ. Calif.). (*Cornell Vet., 33 (1943), No. 4, pp. 368–369*).—Toxicity in a group of pigs receiving 11.7 gm. per head is attributed to a complication of necrotic enteritis, allowing greater absorption of the drug or its oxidation products.

Anesthesia in horses and swine, A. G. Danks. (Cornell Univ.). (*Cornell Vet., 33 (1943), No. 4, pp. 344–346*).—Observations on the injection of chloral hydrate-magnesium sulfate and pentobarbital sodium are recorded. The former, administered intravenously, was regarded as particularly satisfactory with mature hogs and the latter, administered intraperitoneally, with small pigs.

The equine thyroid in health and disease, W. W. Dimock, C. Westerfield, and E. R. Doll. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 807, pp. 313–317*).—This is a study based on microscopic sections of the thyroid gland from 59 adult horses and equine fetuses.

Spastic paralysis in domestic rabbits, E. L. Vail (*Jour. Amer. Vet. Med. Assoc., 104 (1944), No. 807, pp. 334–335*).—This condition is described, and experiments are reported which indicate that effective treatment should include vitamin A.

Bibliography of poultry diseases (*Bibliog. Poultry Diseases, Lab. Workers Pullorum Disease Control [New Brunswick, N. J.], 8 (1943), Nos. 1, pp. 24+; 2, pp. 18+*).—A continuation of this bibliography (E. S. R., 89, p. 119).

Additional field outbreaks of coccidiosis in chickens due to Eimeria brunetti, P. P. Levine. (Cornell Univ.). (*Cornell Vet., 33 (1943), No. 4, pp. 383–385*).—This report records the occurrence of three additional outbreaks of coccidiosis in chickens in which *E. brunetti* was found to play a role (E. S. R., 89, p. 119).

Cultivation and preservation of Diplococcus pneumoniae and Mycobacterium tuberculosis in market eggs, A. J. Gelarie (*Jour. Lab. and Clin. Med., 29 (1944), No. 5, pp. 532–533*).—Observations are noted to "prove that the ordinary fresh market egg is a suitable and valuable medium for the cultivation and preservation of pneumococci and tubercle bacilli. It can just as well be utilized for the primary isolation of these micro-organisms and probably for others as well."

The isolation of Pasteurella aviseptica from a turkey, H. W. Smith and H. I. Field (*Vet. Jour., 100 (1944), No. 2, pp. 35–38*).—Post-mortem and bacteriological examination of a turkey poult indicated that the organism responsible for its death was *P. aviseptica.* It is suggested that this may be responsible for some acute but isolated deaths of turkeys and chickens.

Influencia de factores climáticos sobre los ooquistes de Eimeria tenella [Influence of climatic factors on the oocysts of E. tenella], L. M. E. De Benedetti (*Buenos Aires Univ., Rev. Facult. Agron. y Vet., 10 (1943), No. 3, pp. 544–557; Eng. abs., pp. 555–556; Portug. abs., pp. 556–557*).—"The experiments made with dry and moist heat, dry and moist cold, moisture, desiccation caused by lack of aeration, putrefaction, sun, and light enable us to affirm that in general the oocysts are sensible to the influence of these climatic factors, being destroyed in a more or less short time, when they are submitted to its action, according to the applied temperature or the 'time of exposition.' . . . As a prophylactic measure, it is advisable to dry-clean the places where fowl are kept and to let the sun have free access to the fecal matter, keeping in mind that the moist ambient air is in all cases the most propitious for the propagation of this parasitic disease."

Pasteurellosis in California Valley quail, W. R. Hinshaw and J. T. Emlen. (Univ. Calif.). (*Cornell Vet., 33 (1943), No. 4, pp. 351–354*).—This is a report of an acute outbreak of pasteurellosis in a group of 25 California Valley quail (*Lophortyx californica*) trapped in a San Benito County almond and prune orchard, held in holding pens for about 1 mo., and shipped to Davis for experimental purposes. They were apparently normal on arrival, but 5 days later 7 were found dead. A diagnosis of pasteurellosis was made, cultures isolated being typical Pasteurellae. The possible danger of transmission to domestic birds is pointed out.

AGRICULTURAL ENGINEERING

Use of nomograms in solving stream-flow routing problems, R. K. Linsley, Jr. (*Civ. Engin., 14 (1944), No. 5, pp. 209–210, illus. 2*).—The author has found that nomograms or alinement charts can often be developed for the solution of the storage equation in many of its forms. Some examples are cited. The form of the equation used was: $\overline{I} + (S_1 - \frac{1}{2} O_1) = (S_2 + \frac{1}{2} O_2)$, in which S = volume of storage, O = rate of outflow from reach (subscripts 1 and 2 refer to the beginning and end of the routing period, respectively), and $\overline{I}$ = average rate of inflow during routing period. Examples accompanying the note are routing nomograms for the Kern River above Bakersfield, Calif., and for the Sacramento River from Shasta Dam to Red Bluff.

Great variation shown in amount of water applied in single irrigations of farm crops, F. E. Brown (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 3, pp. 5–8*).—Measurements and records of the amount of water applied in a single irrigation of various crops by different farmers showed considerable variation. A few were extremely light, less than 3 in., while 58 of the 132 measurements showed that more than 6 acre-in. was applied. With all other factors held constant, the assumption that use of long furrows results in a heavy application would be found to hold. The data "show clearly that principles outlined for good irrigation practices must be based on several variables and must be varied as conditions vary."

Need for water-yield records from small drainage basins, M. T. Thomson (*Agr. Engin., 25 (1944), No. 5, pp. 177–178, 180, illus. 1*).—Information as to dependability of water flow during dry periods, though generally available for the larger streams, is inadequate for the streams draining watersheds of less than 10 sq. miles; and it is from these smaller streams that many farmers obtain much or all of their supply. Although it is not feasible to pursue such a program on small streams as is done on large streams, it may be possible to establish a number of gaging stations on small streams representative of the various conditions with respect to the conditioning factors to serve as indexes of water yields and to show the daily and seasonal fluctuations. Many of the small streams could be measured at critical times and a relationship between any stream and the index streams established. Likewise, relations between geological, physiographic, and other relevant factors could be devel-

oped, so far as practicable, for use in problems of water yield. From a survey of this nature, it would be possible for a competent hydrologist to visit a stream at almost any time, measure it, and advise the farmer as to the probable dependable or low-water yield.

Expansion of clay and concrete drain tile due to increase of temperature and moisture content, D. G. MILLER and C. G. SNYDER. (Minn. Expt. Sta. coop. U. S. D. A. et al.). (*Agr. Engin., 25 (1944), No. 5, pp. 179–180, illus. 1*).—It appeared from these studies of 6-in. by 1-ft. tiles that expansion of clay tile after installation, due either to increase of temperature or to increase in moisture content, of sufficient magnitude to impair the effectiveness of a tile line is improbable. The same may be said of dry-tamped concrete tile as regards expansion due to temperature changes, but concrete tile should be laid when not too dry. Under ordinary conditions, concrete drain tile which have lain on the ground for a few days previous to installation will have absorbed enough moisture practically to eliminate the possibility of subsequent undue expansion. It is believed that water seal of the joints of a tile line is chiefly attributable to overclose butting of the tile with extremely true ends, to sealing of the joints by soil fractions, or to both, rather than to expansion of the tile because of temperature and moisture increases, although temperature and moisture increases could be contributing factors.

Purification of water by use of synthetic ion-exchange resins, using pH as a control, A. L. KENWORTHY and J. N. HOWARD. (Fla. Expt. Sta.). (*Soil Sci., 57 (1944), No. 4, pp. 293–297*).—The use of certain synthetic resins in the purification of water appeared very promising. The water treated with these ion-exchangers was comparable to distilled water, and in many respects superior. In several respects the de-ionized water was found comparable to redistilled water. Conductivity determinations indicated that the break-through point for the towers may be determined by the use of an ordinary laboratory model pH meter. Such a meter may also be used to regulate the regeneration and washing process after each cycle.

Germination trials with sporangia of *Phytophthora infestans* Thax. (Guss.) indicated a continued absorption of copper after the cation exchanger is saturated and a copper content of the water lower than that of distilled water but greater than that of redistilled water.

Studies of raindrop erosion, W. D. ELLISON. (U. S. D. A.). (*Agr. Engin., 25 (1944), Nos. 4, pp. 131–136, illus 8; 5, pp. 181–182, illus. 2*).—In these experiments, conducted by the project supervisor, North Appalachian Experimental Watershed, the effects on raindrop erosion of changes in each variable were studied.

Velocities of raindrops were varied from a maximum of 19.2 ft. per second to a minimum of 12.0 f. p. s. Drop sizes of 3.5 and 5.1 mm. were used, and rainfall intensities were 4.8, 6.6, 8.1, and 14.8 in. per hour. Soils contained in the surface flow on the plat as well as that in the runoff at the bottom of the plat were also determined. In one series of experiments samples were taken from the soil surface following rainfall. Analyses of samples included quantity determinations as well as determinations of aggregate sizes and soil particle size distributions. Artificial rainfall was used and was applied from an apparatus by means of which the raindrop velocity, drop size, and rainfall intensity could be varied independently.

When the drop size was 5.1 mm. and the drop velocity 18 f. p. s., the maximum distance of splash was found to be 5 ft. Some stone fragments as large as 4 mm. were splashed 8 in., and soil aggregates and particles of 2 mm. were carried as far as 16 in. In a second experiment, drop size being 3.5 mm. and drop velocity about 17 f. p. s., the maximum distance particles were splashed was about 3.5 ft., and some soil aggregates and stone fragments of 2 mm. were carried as far as 8 in. There was a downhill movement of stone fragments as large as 8 mm. diameter. Samples

of splash contained a greater percentage of sand and gravel than did the original soils. This increase was from about 25.3 percent for the original soils to 31.2 percent for the samples of raindrop splash. Particle-size determinations in the surface flow indicated about 5 percent sand and gravel and 95 percent silt and clay. The samples of splash contained a greater percentage of aggregates smaller than 0.105 mm. than did the original soils. This increase was from about 53.5 percent for the original soils to 72.2 percent for the samples of raindrop splash. Aggregate determinations in the surface flow showed a rise in the proportion of small aggregates from about 53.5 to 90.2 percent, and in the soil surface from the original value named to 57.1 percent. The ratio of the quantities of soil in the splash caught in the uphill side of the samples to that caught in the downhill sides was found to average 3.1, indicating distinctly more down-slope than up-slope movement by splash action. Quantities of soil found in the splash and in runoff relative to the time of rainfall were also determined.

In the second paper the author quotes a regression analysis of the splash data noted above and discusses the practical significance of the experimental and mathematical observations.

Mathematically, it was found possible to fit a relationship of the form: $E = k\,V^a d^b I^c$, in which E = grams of soil carried by the samples of splash in a 30-min. run; V = drop velocity in feet per second; d = diameter of drops in millimeters; I intensity in inches per hour; and k, a, b, and c are the constants to be determined. In logarithmic form: $\text{Log } E = a \log V + b \log d + c \log I + \log k$. The process used was that of fitting a relationship of the exponential form by the method of least squares. It is pointed out that this is equivalent to fitting a relationship of the logarithmic form by the method of least squares, provided that each of the original observations is given a weight proportional to E^2. The F-test was used to evaluate the significance of the whole relationship. The t-values for each of the coefficients a, b, and c were computed to evaluate their significance. For 55° of freedom, all of the t-values are highly significant. The F-value for this relationship is 143.17 and it is also highly significant. In the preliminary graphing, the curvilinearity of the relationship between E and V seemed such as possibly to justify extending the exponential equation to $E = k\,V^a\,d^b\,I^c\,10^{eV}$. The resulting F-value was 121.02, an observation which, with the t-values found, led to the conclusion that no gain is to be obtained by inclusion of the term 10^{eV}. The analysis showed the best-fitting evaluation of the exponential relationship to be: $E = 0.00007661\,V^{4.33}\,d^{1.07}\,I^{.65}$.

Since intensity of erosional activity is so sensitive to changes in raindrop velocities [in proportion to a power of the velocity greater than its fourth power], it is held to be important to study methods of controlling these velocities under field conditions. Most mulches that are of practical use are probably not as effective as many vegetal canopies. The effectiveness of the canopies may, perhaps, be improved by developing lower growing plants and through better use and improved distribution of canopies in the land-use plans. Vegetal canopies not only reduce high raindrop velocities approaching the soil surface, but also impede the movement of soils in the splash process and thereby curtail soil loss from the sloping areas; they may also reduce wind carriage of the splash. Other implications of the physical and mathematical data are considered at some length.

Integrating farm machinery with the tractor, H. E. PINCHES (*Agr. Engin., 25 (1944), No. 5, pp. 173–174, illus. 1*).—The author points out that the tractor, in addition to its commercially applied capacity to trail various machines or trains of machines and to supply these implements with power through a power take-off, can (1) carry, or at least partially support, all of the implements which work with

it, instead of merely pulling them, permitting elimination of wheels and framework necessary with nonintegrated equipment; (2) steer the implements, both for gross movements of the whole implement and also, if necessary, for differential steering of parts of an implement; and (3) supply power in numerous forms. Besides the power transmission provided by the currently used forms of power take-off, the tractor can supply power by several means of flexible transmission which include a flexible shaft, a completely flexible shaft distinguished from the jointed shaft of the power take-off; by hydraulic means; by pneumatic means; or by means of an electric current generated on the tractor and transmitted for use through electrical apparatus on the equipment. For a more extended development of tractor-mounted equipment, improvement in the ease of mounting and dismounting is urged. Standardization of row spacings to permit corresponding reduction in the number of machine sizes necessary is needed to facilitate strip cropping, terrace construction, etc. The importance of providing greater comfort and convenience for the agricultural machine operator is also noted.

Farm machine situation in Texas, H. P. Smith. (Texas Expt. Sta.). (*Farm Impl. News, 65 (1944), No. 7, pp. 20, 25, 36, illus. 2*).—The most urgent mechanical need is that for tractors, followed by that for such tractor-mounted or -operated equipment as planters, cultivators, haying equipment, plows, and combines. Installation of some 15 driers owned by farmers or commercially operated has promoted use of the combine for rice harvesting, and many grain combines have been converted. The author cites data indicating that the self-propelled combine harvested an average of 13.5 acres in a 7.7-hr. day where the yield averaged 13.55 bbl. per acre. Allocations of materials for a substantial number of cotton harvesting machines of both the stripper and picker types have been requested. Trials have indicated that under some conditions a two-row tractor-mounted "Morco" cotton stripper could be so used that the saving in labor cost alone would be sufficient to pay for a $1,000 machine in 3 or 4 days. Combine harvesting of sorghums and the possibilities of the corn picker and improved hay-baling machines, when they become available, are also taken up, together with the probable extent of the post-war substitution of "jeeps" for trucks and tractors.

Mechanical harvesting of cotton has arrived, H. P. Smith. (Tex. Expt. Sta.). (*Agr. Engin., 25 (1944), No. 5, pp. 167–168, 172, illus. 1*).—The author reports upon successful trials of both barbed-spindle pickers and strippers of a finger type. Spindle machines of two of the more prominent agricultural machinery makers are partially described, together with home-made and commercially made stripper machines. Of one of the strippers tested in harvesting a hybrid strain of cotton at Lubbock in October 1943, the efficiency was 96.2 percent at 1.8 miles per hour and 93.8 percent at 3.4 m. p. h. For a two-row tractor-mounted cotton stripper found capable of harvesting, with an allowance of tractor costs at 60 ct. per hour, tractor operator and helper at $6 per day, and depreciation and necessary repair charges at $8 per day, at the rate of six bales a day, "the total cost would be $18.80 per day, or $3.13 per bale. The average price for snapping 2,000 lb. of cotton last year was $1.50 per 100 ($30 per bale), or $180 for the six bales. This leaves a net saving, when the machine is used, of $26.87 per bale, or $161.20 per day."

No mechanical solution of the problem of separating leaf trash from the harvested cotton has been attained, but the author feels that there is much reason to hope for a solution by the herbicide method, a treatment of the plants before mechanical harvesting with a chemical causing the leaves to drop from the plants.

Spinning tests of mechanically harvested and picked cotton from three varieties suitable for machine stripping or picking showed no significant differences in the strength and appearance of the yarn among the three methods of harvesting.

Filling the spray tank, E. J. RASMUSSEN and W. H. SHELDON (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 303–308, illus. 5*).—The rapid tank refiller here described is essentially a venturi or constriction in a tube and a jet through which water from the spray pump is forced at high velocity, moving a larger amount of water through the venturi at low pressure. The principle of operation of such an aspirator, or injector, type of pump is very briefly indicated, and the construction from common pipe fittings of such pumps in various sizes is described. The venturi constriction is obtained in each instance by joining the smaller ends of two like reducing couplings through a close nipple. A large close nipple in the wider end of one of the reducing couplings is used to attach a large coupling, and a small nipple of a length suitable for centering the jet is brazed into the side of the large coupling. A small elbow-nipple coupling and a pipe slug drilled to provide a suitable jet opening complete the jet assembly. The parts required for four sizes of the injector are tabulated, and dimensional drawings of three sizes of the pump are included. The high-pressure injector stream is provided by the spray pump.

[A cinder-concrete block charcoal kiln] (*Connecticut [New Haven] Sta. Bul. 477 (1944), pp. 65–66*).—A charcoal kiln of a type the same as that of the successful portable steel kiln described in Bulletin 448 (E. S. R., 86, p. 394) was constructed from hollow cinder-concrete blocks at a cost somewhat less than that of a metal kiln of the same size. No prefabrication is necessary, and only stock sizes of the blocks are required. The preliminary runs showed promise.

Resistance of soybeans and oats to air flow S. M. HENDERSON. (Iowa Expt. Sta. coop. U. S. D. A.). (*Agr. Engin., 25 (1944), No. 4, pp. 127–128, illus. 4*).—The author used apparatus and technic the same as that discussed in detail in a like study of the ventilation of shelled corn (E. S. R., 90, p. 837), and reports here only observations and numerical data. These figures showed that the relationship between the rate of flow and air pressure for a given depth of soybeans is of the form $Q = KP^c$, in which K is a function of the depth of the grain and c the slope of the curve. The values for K and c for soybeans were calculated from the curves shown for the various depths and are tabulated. K was found to be $67.0\ D^{-0.057}$ and c, $0.6\ D^{0.064}$. It is held probable that because of the character of the curves the formulas apply fairly well both above and below the observations made in the study. The curved character of the flow graphs for oats made a similar simple mathematical interpretation of the data impossible. Settling the soybeans by shaking and pounding the stack and by tamping reduced the rate of flow to 88 percent of that through the unpacked seed. Similar settling reduced the flow through the oats to 77 percent. Some comparative air-flow data for various grains (shelled corn, wheat, barley, oats, soybeans, and sorghum) are given.

Results of a farm survey of frozen food units, D. E. WIANT. (Mich. State Col.). (*Agr. Engin., 25 (1944), No. 5, pp. 183–184*).—From a survey questionnaire returned by 105 Michigan owners of freezing cabinets, the author concludes in part that: The only apparent basis for selecting the size of frozen food unit to be purchased seems to be the price and an accessible location for the unit. There is no apparent relation between number in the family and capacity of unit, nor between the distance from town or from a community frozen-food locker plant and the size of the unit purchased. Many of the owners would buy larger units if they were to buy again. The frozen food unit is more popular for preserving meats than for preserving fruits and vegetables. Only a few owners take advantage of the service offered by the community frozen-food locker plant. The basement seems to offer the most desirable location for the unit, but some owners report that it was necessary to buy a unit smaller than needed in order to get it into the basement. Some users are freezing such large amounts of meat at a time that it requires 36–48 hr. to complete

the process. Opinions regarding quality of frozen products indicate that some users either are not choosing varieties best suited for freezing or are not properly preparing them for freezing and storage. Frozen food units for the home seem to be comparatively free from mechanical troubles.

Implications of these findings with respect to (1) advice which should be given prospective purchasers, and (2) modification of design, are briefly indicated.

Seasonal loading and freezing rates of domestic frozen food cabinets, J. E. NICHOLAS and G. OLSON. (Pa. Expt. Sta.). (*Agr. Engin., 25 (1944), No. 5, pp. 169–172, illus. 10*).—Experiments carried out during the 3 yr. 1941–43 are reported upon in some detail.

Total food products frozen and stored in the 15-cu.-ft. box mounted to 220 qt. and 125 pt., weighing approximately 406 lb., which occupied roughly 11.25 cu. ft. Its average operating cost was 125 kw.-hr. per month based on a year's performance. This included all freezing operations and incidental losses incurred during placing, shifting, and removing packages. Measurements of packages in the frozen state showed that on the average a pint package occupies 40.5 cu. in., while a quart required 65.5 cu. in. These figures varied with the tightness of packing. Every package was weighed before and after freezing. A few showed slight damage or were partially open because of handling during storage. Loss in weight of nearly 20 percent was found in one package. Properly sealed packages were in good condition. Some showed no loss in weight, a few a loss in excess of 1 percent, and others were found to have gained in weight from less than to slightly more than 1 percent. Frost on the outside of the package from plates or coils during storage or spillage from other packages accounted for the gains.

Rate-of-freezing data for pork shoulder packages of various sizes and for fruits and vegetables of several sorts and types of preparation are given as time-temperature curves.

AGRICULTURAL ECONOMICS

[Papers on agricultural economics] (*Jour. Amer. Soc. Farm Mgrs. and Rural Appraisers, 8 (1944), No. 1, pp. 8–25, 26–32, 35–44, illus. 3*).—Included are the following papers: Canada's Contribution to the War Food Supply, by E. C. Hope (pp. 8–15); Farm Real Estate Market Controls, by J. Ackerman (pp. 16–25); Are Land Prices Too High?—Yes, by J. C. Bottum (pp. 26–29) (Purdue Univ.), and No, by E. Walley (pp. 30–32); Land Settlement for Returned Soldiers, by G. Murchison (pp. 35–40); and Farm Income Tax Management, by T. D. Morse (pp. 41–44).

Current Farm Economics, [June 1944] (*Cur. Farm Econ. [Oklahoma Sta.], 17 (1944), No. 3, pp. 67–92+, illus. 1*).—The usual review of the agricultural situation and the usual tables of indexes are continued. An article, The Land Market Situation, by M. M. Tharp and R. T. Klemme (coop. U. S. D. A.) (pp. 73–79), includes tables showing for four counties for 1941, 1942, and 1943 and the first 3 mo. of 1943 and 1944, the number of tracts sold and resold, average prices received, size of tracts, types of sellers and buyers, amounts and sources of credit, etc. A second article, The Farm Labor Situation in Southeastern Oklahoma, by R. T. McMillan (pp. 80–87), discusses the population, migration of population, increase in employment, size of farm units, farm ownership, etc. A third article, The Effect of Cotton Driers on Grades of Oklahoma Cotton, by J. D. Campbell (pp. 88–90), shows the increase, 1935–43, in number of gins equipped with driers, and average grade indexes and staple length of cotton, 1942–43 and 1943-44, from gins equipped and not equipped with driers.

[Investigations in agricultural economics by the North Dakota Station] (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 5, pp. 15–17*).—Included are the

usual tables by P. V. Hemphill of average prices received by North Dakota farmers, with comparisons as of April 15, 1944; a table by H. L. Walster showing the number, estimated membership, and estimated business, 1942–43, of North Dakota farmers' marketing and purchasing associations, including associations for different commodities; and a table showing by geographic divisions of the United States the business of farmers' marketing and purchasing associations and the percentages of total estimated business. Also included are some findings by T. E. Long as to the quantities of potatoes that can be delivered per minute per man to bins using different methods and equipment.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 228 (1944), pp. 206–207, 211*).—Included is an article by J. H. Sitterley and J. I. Falconer on Farm Auction Sales (pp. 206–207), showing the number of sales by months, January-March and August-December in 1940, 1942, and 1943, and for January and February of 1944, and discussing the reason given for the sales. The table of index numbers of production, prices, and income by Falconer is brought up through February 1944.

[Dissertations on farm management] (In *Abstracts of Dissertations, 1941. Charlottesville: Va. Univ., 1941, pp. 80–90*).—Included are the following dissertations accepted in partial fulfillment of the requirements for the degree of doctor of philosophy: The Representative Farm—Budgetary Analysis in Farm Management Research, by R. E. Graham, Jr. (pp. 80–84), and Farm Management Research in the South, by D. G. Miley (pp. 85–90).

Land settlement: A list of references, A. M. Hannay (*U. S. Dept. Agr. Libr. List 9 (1944), pp. 167*).—This list of selected references for the years 1938–43 and a part of 1944 includes 29 general references, 497 for the United States, 2 for the Philippine Islands, 11 for Puerto Rico, and 836 for various foreign countries. It partially supplements Miscellaneous Publications 172 (E. S. R., 72, p. 403) and 284 (E. S. R., 79, p. 266).

The rural-urban economy of the Elmira-Corning region, H. E. Conklin (*Jour. Land and Pub. Util. Econ., 20 (1944), No. 1, pp. 3–19, illus. 6*).—This article, based on a study made by the New York State College of Agriculture and the Division of Commerce of the State of New York, deals principally with the open-country commuting area.

The major findings were: A large part of the open-country population within an area of 30 miles is dependent on urban employment for all or a substantial proportion of its income and will continue to seek such employment because its farm and rural employment opportunities are limited; a small part of the farm population is on farms of a size and quality that do not necessitate off-farm work to provide a satisfactory income; and the economic well-being of a large part of the rural population is more closely related to the level of industrial activity than to general agricultural prosperity.

Land utilization and agricultural adjustment in Edgefield County, South Carolina, M. J. Peterson and G. H. Aull. (Coop. U. S. D. A.). (*South Carolina Sta. Bul. 349 (1944), pp. 43, illus. 10*).—This study is based on an approximate 10-percent sample (173 farms) of A. A. A. records for the county. The soil types, productivity areas, land use, slope, topography, erosion, and use capability of the lands of the county are described, and analyses are made of farm real estate taxes and government policies and programs. Analysis is also made of sample farms showing size of business, combination of enterprises, labor supply and requirements, crop yields and effect of improved practices, and farm income. In the analyses the farms are considered in part by size and productivity area. Organizations for farms in each productivity area are suggested with tables showing organization and the effects of improved practices for 1943 and 1945–49.

Land utilization in Henry County: A study of the effect of industrialization on rural land utilization, W. L. Gibson, Jr., and S. Bell, Jr. (*Virginia Sta. Tech. Bul. 93 (1944), pp. 35, illus. 2*).—The agricultural and industrial development of the county are described. The adaptability of the land for agriculture, including the classification of the land, the organization and production of farms in areas adapted and not adapted to agriculture, and farm income and debt-paying ability are discussed. Analysis is made of the use, investment, returns, etc., from full-time commercial farms, full-time subsistence farms, and part-time farms used for residential purposes, subsistence, and commercial purposes. The use of land for rural residential purposes and the areas of woodland not included in farms are discussed. Recommendations are made as to the future agricultural development and the forestry policies for nonagricultural land.

Economic considerations in planning for soil conservation on the Chehalem Mountain project, Oregon, G. W. Kuhlman, H. L. Thomas, and C. A. Loe. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 156 (1943), pp. 52, illus. 18*).—This study was made to determine the changes in land use and farming practices made to control erosion on the project located near Newberg, Oreg., and to show the probable effects of adopting a soil conservation program on farm production, expenses, and income. Detailed analysis is made of a farm representative of each of the leading types of farming. The climate, topography and soil, erosion and run-off of the area, and the general aspects of the soil conservation program are described. A conservation plan with data as to land use, estimated crop production, major items of cash farm receipts and expense, etc., before and after conservation and alternative farm management considerations are discussed for an 80-acre dairy farm, a 145-acre diversified farm, a 40-acre berry farm, and a 27-acre walnut farm.

Quality of land as a factor in farm organization, crop yields, and farm income in Roane County, Tennessee, H. J. Bonser, L. G. Kerby, and A. K. Schmidt (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 172 (1944), pp. 40+, illus. 37*).—The farm population, climate, soils, topography, agriculture, markets, transportation facilities, and land class of the area are described. Analyses are made of the relations of slope of land and land class to yields; land use to land class; land class equivalent (an index based on normal corn yields) to use of land in crops, livestock, and labor; and relations of land class equivalent to investment expenses and financial returns.

Foreign Agriculture, [July 1944] *U. S. Dept. Agr., Foreign Agr., 8 (1944), No. 7, pp. 147–168+, illus. 5*).—Included is an article, Canadian Agricultural Policy, by M. Ogdon (pp. 147–158), discussing the pre-war import duties, wheat subsidies, and quality premiums; the wartime economic control; the operations of wartime meat, dairy products, special products, and wheat boards; the post-war prices and surpluses problem; and international cooperation affecting agriculture. Another article, The Agriculture of Northern Libya, by V. B. Sullam (pp. 159–168), describes the topography, soils, climate, water supply, native and Italian farming, and the effects of the war.

Characteristics of former and present farm owners, R. T. McMillan. (Okla. A. and M. Col.). (*Jour. Land and Pub. Util. Econ., 20 (1944), No. 1, pp. 52–55*). —Using 218 paired records obtained in Oklahoma, western Kansas, and southeastern Colorado, a table is presented and discussed, comparing specified social-economic characteristics of present farm owners and former owners now tenants or farm laborers.

Revised annual estimates of farm-mortgage debt by States, 1930–43, D. C. Horton and H. D. Umstott (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 21+, illus. 7*).—The methods used in revising the annual farm-mortgage series 1930–43 and the estimates for intercensal years 1935–40 are described. Tables show the

estimated amount of farm loans outstanding by States as of January 1, 1910–43, and the revised estimates by geographic divisions for 1935 and 1940. A chart compares the revised and previous estimates 1930–43 for the United States and the North Atlantic, North Central, Southern, and Western States. Other tables, charts, and maps show for the United States or the different geographic divisions data as to the amount of farm-mortgage loans; debt per $1,000 valuation of farm real estate; value of farm real estate per acre and gross farm income; volumes of foreclosures, assignments, and voluntary transfers of farm real estate; ratios of farm-mortgage debt to value of all farms, and mortgaged farms; etc.

Sales contracts and real estate investments of life insurance companies, H. C. LARSEN (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 13+, illus. 3*).—This is a companion report to that on farm-mortgage investments (E. S. R., 90, p. 843). It discusses the investments in sales contracts, the real estate acquirements and disposals, the distribution by States, and the changes during 1942.

Wartime labor survey of Indiana dairy plants, E. H. MATZEN (*Indiana Sta., Agr. Econ. Mimeog. No. 31 (1944), pp. 13+, illus. 1*).—The information obtained as of about May 1, 1944, from 88 dairy plants handling approximately 43 percent of the milk and cream marketed, obtained through mailed questionnaires, is summarized and the need for additional labor; the changes in milk and cream receipts in relation to labor from April 1, 1940, 1943, and 1944; the labor turn-over and losses; sex, age, and hours of labor; and the keymen are discussed.

In April 1944 the plants handled 36 percent more milk and slightly less cream than in April 1940 with only 6 percent more labor. It was expected that receipts in June 1944 would be 23 percent greater than in April 1944. For 52 percent of the plants the April labor force was adequate for June, but three-fourths of the June receipts were expected in plants needing additional labor in April. Employees in April 1944 handled 4.3 percent more milk per employee than in April 1943 and 11 percent more than in April 1940. Of the employees 17 percent were women in April 1944 as compared with 14.6 percent in April 1940. Average hours per week per employee increased from 49.6 hr. in 1940 to 53.6 hr. in 1944. Labor turn-over was 88 percent in 1943 and 20 percent in the first 4 mo. of 1944. Military service took 13.5 percent of the employees lost in 1943 and 16.3 percent of those lost during the first 4 mo. of 1944.

Facilities and agencies of Knoxville milk industry, 1943, B. H. LUEBKE, C. C. MANTLE, and W. S. ROWAN (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 171 (1944), pp. 39+, illus. 11*).—The availability of processing and distribution services in the Knoxville milkshed area is discussed in sections dealing with the development of the Knoxville milk industry, the classification and location of the marketing agencies, the organization of distribution agencies, the capacity and output of plants, the major types of investment in pasteurization plants, and the facilities of raw milk retailers, bulk buttermilk distributors, and Knoxville Milk Producers' Association. An appendix includes some of the State and city regulations affecting milk plants.

Mexico's cattle industry, E. H. JOHNSON (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 6, pp. 103–106, 116, illus. 5*).—A discussion of the various phases of cattle production in Mexico.

Possibilities of sweetpotato production in west Tennessee, S. W. ATKINS and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 168 (1944), pp. 50+, illus. 9*).—Information regarding production practices, costs, and returns was obtained through interviews with growers in Henry County, representative of the principal commercial sweetpotato area, and Madison County, representative of the noncommercial sweetpotato area. Information regarding storage and marketing was furnished by dealers and warehousemen in the two counties and

also in Gibson and Weakley Counties. The labor requirements and distribution, other production practices, costs, returns, etc., and the possibilities of increasing sweetpotato production through use of idle land, substitution for competing crops, and improved practices are discussed.

The fruit industry of Mexico, F. A. Motz and L. D. Mallory (*U. S. Dept. Agr., Foreign Agr. Rpt. 9 (1944), pp. 184, illus. 131*).—The topography, climate, soils, transportation facilities, consumption of fruit, etc., in Mexico are described. The citrus, tropical, and deciduous fruit industries are discussed, including such subjects as production, varieties, cultural practices, harvesting, grading, costs of production, marketing prices, exports, etc. The Mexican fruit markets and marketing methods are described. Mexico as a market for United States fruit and the United States as a market for Mexican fruit are discussed.

An analysis of the frozen fruit industry in Utah, D. G. Sorber. (U. S. D. A.). (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 2, pp. 1, 8–10, illus. 1*).—*A* popular article on frozen fruit industry in the United States and the present status and possibilities in Utah.

"In conclusion it can be said that there is every indication of a rapid expansion of the frozen fruit industry in the United States in the post-war era. As to the question of the possibility of a relatively large permanent frozen fruit industry being established in the State of Utah, only the growers and packers and the economic and labor conditions with which they are faced can provide the answer."

Imperfect competition in agricultural processing and distributing industries, W. H. Nicholls. (Iowa Expt. Sta.). (*Canad. Jour. Econ. and Polit. Sci., 10 (1944), No. 2, pp. 150–164*).—The monopoly elements considered are market sharing, other nonaggressive price behavior, price leadership, bilateral monopoly, price discrimination, and product and service discrimination. The discussions are centered on the central wholesaler and the country assemblying agency.

World wheat survey and outlook, May 1944, H. C. Farnsworth and V. P. Timoshenko (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 20 (1944), No. 5, pp. 171–209+, illus. 2*).—"The crop year 1943–44 may long be remembered as the year of record diversion of wheat to nonfood uses, including fuel in Argentina. In the United States alone, some 600 million bushels will be used for feed and industrial alcohol. . . . A substantial portion of the wheat fed in the United States is coming from Canada. For the first time in more than a century the United States will rank as the second largest net importer of wheat in the world—surpassed only by the United Kingdom. . . . European nations, including Britain and Soviet Russia, have continued to enforce measures against the feeding of bread grains and to stretch wheat supplies through various milling and baking regulations. Rationing now limits human consumption of bread in all European countries except the United Kingdom, Eire, and perhaps Rumania. . . . The present outlook for 1944–45 is for little change in the domestic bread-grain supplies of Continental Europe ex-U. S. S. R., and for historically large, though reduced, wheat supplies in each of the four overseas exporting countries. The prospective supplies in North America will not permit as heavy diversion of wheat to nonfood uses as is estimated for the current year. A considerable reduction of livestock numbers appears necessary in the United States."

A study of the Detroit supply of fresh vegetables and fruits during a war year, [1943], E. H. Bjornseth (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 320–329, illus. 2*).—Analysis of data from the U. S. D. A. War Food Distribution Administration, the Detroit Farmers' Market Report, chain stores, and estimates as to Victory Gardens by the Office of Civilian Defense showed that, while supplies of fresh vegetables and fruits available in 1943 increased, the increase was not as great as that in population. Receipts of locally produced produce were 42.1

percent below the average for 1932–42. The quantity shipped in was about 25 percent greater than the average for 1933–41. Victory Gardens offset a considerable part of the reduction in local truck crop production. The estimated amount of produce available in 1943 was 606,068 truck loads, of which 6.8 percent was from Victory Gardens and 73.9, 2.7, 11.9, and 4.5 percent, respectively, from the Detroit Union Produce Terminal by carlots and by truck, the Detroit Farmers' Markets, and chain stores.

La distribucion de carnes en Puerto Rico [The distribution of meat in Puerto Rico], S. Díaz Pacheco and M. Roses (*Puerto Rico Univ. Sta. Bul. 65 (1943), Span. ed., pp. 42; Eng. abs., pp. 39–42*).—Results of this study indicate that for the period covered meat dealers, wholesalers, and retailers did not make sufficient income to cover expenses and obtain a reasonable return for their labor and management. In many instances, it is stated, meat businesses in the island are maintained as a means of employment rather than an investment. They have provided additional sources of employment and the creation of goods and services otherwise lacking, and their disappearance would only add to the ever-present problem of chronic unemployment.

Marketing turkeys in Kentucky, J. B. Roberts (*Kentucky Sta. Bul. 458 (1944), pp. 35, illus. 18*).—The trends in turkey production, the factors affecting turkey prices, the relationship of prices to production areas, and the characteristics of marketing in the United States are discussed. Analysis is made of the industry in Kentucky, marketing methods and practices, and prices of turkeys. Marketing through pools and the turkey marketing associations are discussed and appraised.

Regional markets in New York State, V. H. Nicholson ([*New York*] *Cornell Sta. Bul. 801 (1943), pp. 48, illus. 6*).—This study, conducted during the summers of 1940 and 1941, was made: "(1) To ascertain the extent of the producing areas served by each of four regional markets in New York State; (2) to determine the amount and type of produce sold through such regional markets; (3) to study the nature of business operations conducted by sellers and buyers; (4) to determine the areas to which produce from the regional markets was distributed; and (5) to appraise the regional market as an outlet for perishable farm products."

Data were obtained from 1,061 growers and farmer-dealers, 59 truckers, 562 out-of-town buyers, 116 city peddlers, 56 independent retailers, and 64 city wholesalers, at Buffalo, Rochester, Syracuse, and Menands.

The volume and value of business at the markets, the area of supply for locally grown products, number of trips made by growers, weight and value of products sold per trip, and types and operations of buyers at farmers' and wholesalers' markets are discussed. The market operations of growers including distance to market, trips per year, value and weight of produce per trip, time required for sales, types of vehicles, etc., and the operations of out-of-town buyers are analyzed and discussed. Recommendations are made particularly as to ways in which the time and expenses of growers and buyers can be reduced.

History of cooperative and farmer owned meat packing enterprises in the United States, L. B. Mann (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 72 (1944), pp. 20*).—The early development, 1914 to 1920, of cooperative packing plants, the operating problems and the reasons for failure, and the development after 1930 are described and the future possibilities and need for cooperative meat processing discussed.

Prices paid by Vermont farmers for goods and services and received by them for farm products, 1790–1940; wages of Vermont farm labor, 1780–1940, T. M. Adams (*Vermont Sta. Bul. 507 (1944), pp. 176, illus. 79*).—Included are 123 price series for commodities and services at retail, products of Vermont farms, and farm wages. The first part (pp. 16–84) discusses the prices paid for goods

and services bought by the farmers for food, clothing, building materials, transportation, fire insurance, medical services, taxes, feed, machinery, equipment and supplies, fertilizers, and livestock, from 1790 to 1940. The second part (pp. 84–100), dealing with wages of farm labor, includes data on wages paid for labor hired by the day 1780–1940 and by the month 1805–1940 and makes comparisons with industrial wages. The third part (pp. 100–173) presents data as to prices received for products sold 1790-1940, the cost of producing fluid milk, and the prices of products by groups—dairy products, livestock, poultry, wool, grains, hay, fruits and vegetables, and wood lot products. The trends of prices received, prices paid, and purchase power of farm products are discussed.

Some of the general findings were: The long-time price trends of farm products sold has been upward and farmers have tended to shift from currently lower to higher priced products. Prices of things bought by farmers have had divergent trends.

"In general, imported and industrial products were high priced in the early period and native crop and livestock products were relatively low priced. Those costs which are largely or entirely in the nature of a charge for services rendered have increased. Since 1800 the purchasing power of Vermont farm products over all goods and services taken together has increased at a rate of 0.6 percent per year."

Farm wages have risen somewhat faster than farm product prices, but there is evidence that increases in efficiency have fully offset the greater increases.

"Deviations from these long-term trends have at times been extreme. During periods of rising prices farm products usually rose faster and farther than those of the things farmers buy, with a resultant increase in the purchasing power of farm products. During periods of declining prices the opposite situation has prevailed, and farm purchasing power has been lowered. On the other hand service rates have tended to remain much the same over long periods of time, for the most part rising only during drastic inflation, and then resisting any downward adjustment. Until recent years farm wages have tended to lag during both inflation and deflation, but this has not held true during the two decades since 1920, when they have moved more violently than prices."

Prices and market data on lambs, hogs, and veal calves at four central Kentucky livestock auction markets, 1926–1943, A. J. Brown and C. D. Phillips (*Kentucky Sta. Bul. 459 (1944), pp. 15*).—Tables usually covering the period 1926–43 show: (1) The total monthly receipts at the four auction markets of cattle, calves, hogs, and sheep and lambs; (2) the average monthly prices of all lambs, 76–85 lb. lambs, the top lambs, all veal calves, the top veal calves, all hogs and pigs, 61–140-lb. hogs, 141–180-lb. hogs, 181–220-lb. hogs, and the top hogs; and (3) the monthly average weights of lambs in top pens, all veal calves, all hogs and pigs, and hogs in top pens. Procedures used in developing the several price series are described.

RURAL SOCIOLOGY

Effects of war on farm population in Kentucky, H. W. Beers (*Kentucky Sta. Bul. 456 (1944), pp. 24, illus. 6*).—Among conclusions reached are that despite a State-wide population decline of 10 percent, 1940–43, many rural communities in Kentucky will have more farm population soon after the war than before. Community needs that will afford opportunity for productive employment of the extended population include the construction of better homes, some of them with materials of local origin; the extension of electricity to the farms; modern facilities in the farmhouse; the construction of other farm buildings; farm drainage;

the reorganization of farm layouts to permit soil-conserving tillage practices; the development of country roads; and in some areas the restoration of depleted forest resources. Attention is also called to the need for better schools with longer terms and higher attainments.

Social effects of government land purchase, R. R. NICHOLS and M. B. KING, JR. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 390 (1943), pp. 55, illus. 2*).—The authors examine the effects of the Sardis Reservoir (Tallahatchie River) land purchase in northwestern Mississippi. It is concluded that the criticisms of displacement of the people, delays in payment, the dislocation of the highway system, and the disruption of community life generally were justifiable, and that some of the difficulties encountered could have been avoided.

The farmer has a role in farm-labor-camp operation, W. A. ANDERSON and I. A. SPAULDING. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, pp. 1, 12, illus. 1*).—The authors conclude that the success with farm labor camps in 1943 justifies their continuance in the 1944 season.

Farm labor camps for youth in New York State, I. A. SPAULDING ([*New York*] *Cornell Sta., Mimeog. Bul. 12 (1944), pp. 5+*).—The author reports the results of a study of the organization and management of farm labor camps for youth in the lower Hudson River and the Long Island areas of New York State made in the summer of 1943.

VFV on the farm front (*U. S. Dept. Agr., Misc. Pub. 542 (1944), pp. 12, illus. 30*).—More than 400,000 city boys and girls under 18 yr. of age helped to produce food for freedom by doing farm work as Victory Farm Volunteers in 1943 The organization of the movement and essentials to its success are set forth.

The Women's Land Army of the U. S. crop corps, 1944 (*U. S. Dept. Agr., 1944, AWI-102, pp. [8], illus. 9*).—A description of this organization.

The clientele of the agricultural extension service, D. L. GIBSON (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 237–246*).—This study is based on 656 schedules secured in 1941 from representative farm families in Ingham and Kent Counties. It shows that those of lower socioeconomic status participate decidedly less in the agricultural extension program than do those of high status. The conclusion is drawn that extension workers should continue to serve progressive and successful farmers, but sufficient personnel and facilities should be available to reach other segments of the farm population less privileged and less inclined to use present extension staffs.

Farm youth in the 4-H Club, II, W. A. ANDERSON ([*New York*] *Cornell Sta., Mimeog. Bul. 14 (1944), pp. 14+*).—In this second study (E. S. R., 91, p. 354) it is concluded that 4-H membership is composed, in the main, of youth from farm families living on the best farms, yielding the higher income and giving the greater social status to those who live near the social centers and are accessible by telephone, radio, and travel distance. It was found that the 4-H program reaches only about one in each three of the eligible farm youth.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proposed changes in postwar agricultural college curricula, C. E. ALLRED and H. J. BONSER (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 170 (1944), pp. 30+*).—Part 1 analyzes the replies from the deans of 40 agricultural colleges to an inquiry sent on April 8, 1944, by the curriculum committee of the College of Agriculture of the University of Tennessee. The analysis includes probable action in undergraduate education—general curriculum, curriculum in farm operation, general recommendations, and enrollment—and in graduate, 2-yr., short,

correspondence, and refresher courses. It also briefly discusses the replies from institutions uncertain as to adjustments or not anticipating any. Part 2 includes quotations from the replies.

Digest of the official State five-year plan for vocational education in agriculture in Indiana beginning July 1, 1942, C. T. MALAN (*Ind. Dept. Pub. Instr. Bul. 138 (1943), pp. 32+, illus. 6*).

Food conservation education in the elementary school program (*U. S. Dept. Agr., War Food Admin., 1944, NFC-13, pp. 22+, illus. 5*).—Food wastage from farm to table amounts in this country to about one-fourth of the food produced. This, it is pointed out, is about the amount needed in 1944 to meet the requirements of our armed forces and lend-lease commitments. This publication suggests some ways in which teachers can stimulate interest in a food conservation program that accents activity on the part of elementary school children themselves.

Streamlining projects to meet current problems, W. V. LAMBERT. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 3, pp. 177–182*).—Factors in the organization of research in agricultural experiment stations are discussed, with comments on reorganization of research programs to make them more effective in coping with wartime problems.

Selected references on Thomas Jefferson and his contributions to agriculture, E. E. EDWARDS (*U. S. Dept. Agr. Libr. List 8 (1944), pp. 7*).—The selections have been made with a view to including the main editions of Jefferson's writings, the more comprehensive and scholarly biographies, the significant interpretations of his contributions as a statesman, and the best articles on his interest in agriculture and the related sciences.

FOODS—HUMAN NUTRITION

An evaluation of California vegetables, J. H. MACGILLIVRAY, A. F. MORGAN, G. C. HANNA, and A. SHULTIS. (Univ. Calif.). (*Canner, 97 (1943), No. 26, pp. 12–13*).—Noted elsewhere in greater detail (E. S. R., 91, p. 89).

Bean sprout production in the home, H. C. BEESKOW (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 346–352, illus. 4*).—Directions are given for the sprouting of soy and mung beans in the home, and a few suggestions for their utilization are presented.

Consumer preferences for potatoes in North Dakota, P. V. HEMPHILL (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 5, pp. 5–8*).—Observations of the 60 North Dakota retail food store managers interviewed concerning sizes and quality factors governing consumer purchases of potatoes suggested that, above all, consumers preferred clean potatoes and that uniformity of size was the next important consideration, with smoothness the third most important factor. Medium-sized potatoes (about 2½ in. in diameter) in a uniform lot were most generally preferred; large potatoes and a mixed lot of medium and large potatoes were selected by the dealers as second- and third-choice preferences of the consumers.

Color and palatability of home-canned cherries, R. M. GRISWOLD (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 330–334, illus. 1*).—This is a summary of material to be issued in more complete form as Technical Bulletin 194.

Brining of vegetables is not fully understood, C. S. PEDERSON and H. G. BEATTIE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, p. 16*).—The action of the salt, first, as a preservative itself and, second, to draw water, sugars, and other nutrients out of the vegetable so that bacteria can act on the sugar to form acid is explained. The acid also acts as a preservative in combination with salt. In the dry salting of food the use of small quantities of salt, only 2.5 percent, gives only a weak brine with but little

preservative action; this necessitates rapid fermentation in order that acid will quickly develop to act as the preservative. In dry salting with large quantities of salt, 15 to 20 percent, as is more common for salting meats and fish, the salt brine is the main preservative. With wet brining the vegetables must be covered with the brine in order to exclude air. Weak brines are used in making dill pickles and fermented peppers and green tomatoes. With these the acid produced in fermentation exerts a preservative action and gives a desirable product. With vegetables, such as onions and cauliflower, fermentation produces an undesirable product, so that high salt brines must be used, and the resulting product is then freshened in water.

Proper blanching assures good results, H. D. Brown. (Ohio State Univ.). (*Quick Frozen Foods, 6 (1944), No. 6, pp. 50–51, 54, illus. 3*).—Choice of varieties (commonly raised in Ohio); method of preparation, with emphasis on proper blanching; and packaging are points covered in detail for a number of individual fruits and vegetables preserved by freezing and frozen storage. General instructions are given concerning locker storage and the thawing of frozen fruits and vegetables.

Investigations on the use of Irish moss in canning of meat, E. J. Reedman and L. Buckby (*Canad. Jour. Res., 21 (1943), No. 11, Sect. D, pp. 348–357*). —"In an attempt to develop a suitable substitute for the agar used in large quantities by the canning industry, gelose preparations were made from bleached and unbleached Irish moss [*Chondrus crispus*]. About 30 to 60 percent of the total moss solids, depending on the type of moss used, were extracted in ½ hr. by hot water. Suspended solids were removed by filtration with diatomaceous earth, and the extracts purified with activated charcoal. Extracts were dried successfully on a laboratory model double-drum drier, an experimental spray drier, an experimental tunnel drier, and by air-drying the concentrated extract at room temperature. All methods of drying yielded products capable of forming good jellies. Although agar jellies were definitely stronger than those from equivalent concentrations of Irish moss, the addition of 0.2 percent potassium chloride produced jellies from Irish moss that were stronger than those from agar. On the basis of consumer taste panel tests on canned chicken, no statistically significant difference could be demonstrated between the acceptability of agar and Irish moss jellies."

Fish recipes: Lake herring (*Michigan Sta. Folder 2 (1944), pp. [8], illus. 5*).—This leaflet presents a number of recipes for the preparation of lake herring and herring roe for table use. Directions are given for scaling, cleaning, and filleting the fish and preparing it for freezing.

Freezing meat and poultry products for home use (*U. S. Dept. Agr., 1944, AWI-75, pp. [9], illus. 36*).—A concise outline of instructions, supplemented by illustrations, tells how to prepare poultry, eggs, fish, beef and veal, pork, and lamb for freezing in frozen-food lockers or home-freezing cabinets. Information is given on yields as percentage of live or carcass weights for meats, in pounds or in percentage of live weight for poultry, and for eggs in pounds per case or in percentage of whole eggs. Storage periods for wrapped foods held at 0° F. are suggested.

How to prepare vegetables and fruits for freezing (*U. S. Dept. Agr., 1944, AWI-100, [pp. 9]*).—This pamphlet is a revision of and supersedes AWI-63 (E. S. R., 90, p. 273).

Methods for quick freezing and dehydrating mushrooms, H. J. Brunell, W. B. Esselen, Jr., and F. P. Griffiths. (Mass. Expt. Sta.). (*Food Indus., 15 (1943), No. 11, pp. 74–75, 140–142, illus. 1*).—On the basis of the experimental work described, it is recommended that for dehydration commercially grown mushrooms (*Agaricus campestris*) be cleaned, cut in pieces, blanched in steam for 2

min. 15 sec., and dried at 145°–150° F. to a moisture content of 5 percent or below, and that the dehydrated mushrooms be packaged in moisture-proof containers and stored at a temperature not higher than 75°. For freezing, the mushrooms should be blanched, heat-sealed in moisture-proof cellophane bags, and quick-frozen at —10° under a fan. Storage at —5° is recommended. Data reported on the thiamine, riboflavin, and nicotinic acid content of the fresh, dehydrated, and frozen products indicate thiamine losses of about 17–18 percent in the dehydrated product stored for 5 mo. at 70°–75° and of about 14–17 percent in the frozen product; losses for riboflavin approximated 0–3 percent and 3–4 percent for the two products, respectively. The fresh mushrooms contained 1.2, 5.4, and 62 μg. per gram of thiamine, riboflavin, and nicotinic acid, respectively, on the moist basis, corresponding to 10.7, 49.6, and 570 μg. per gram dry basis.

Quick-frozen peaches quite satisfactory when proper methods and varieties used, T. H. Jones (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 5, pp. 1, 7*). —Preliminary results obtained in one season's work and one competitive test with 16 varieties of Mississippi-grown peaches showed that Elberta ranked first in quality of the frozen product, judged after storage for color, texture, flavor, and general appearance. In the procedure outlined for preparing the peaches for quick freezing emphasis is placed on prompt handling in all steps between harvesting and freezing, particularly after peeling, in order to prevent browning of the tissue. If holding is necessary after peeling and before slicing and packaging in sirup, the fruit should be held under water; one teaspoon of lemon juice per pint of water affords additional protection against browning. Other varieties that were found to give satisfactory frozen products included Early Elberta, Alabama, Oriole, Colora, Valiant, Alton, and Hiley, although all of these rated far below Elberta.

Vegetable and fruit dehydration: A manual for plant operators (*U. S. Dept. Agr., Misc. Pub. 540 (1944), pp. 218+, illus. 76*).—This manual, prepared by the Bureau of Agricultural and Industrial Chemistry, is based on the results of both earlier and more recent work. It does not present detailed results of research, but is designed to facilitate application in commercial production. The subject matter is treated under the following headings: Locating new plants; plant lay-out, equipment, and capital investment; storing and handling fresh fruits and vegetables; preparation of raw materials; blanching; sulfuring vegetables; principles involved in the drying process; effect of drying conditions on quality of product; conveyor-belt dehydrators; tunnel-and-truck dehydrators; starting and stopping the tunnel drier; cabinet dehydrators; sources of heat for dehydrators; temperature controllers; mechanical movement of air in dehydrators; bin-type finishing driers; other types of dehydrators and their use; multistage dehydration; finishing and packaging; final inspection of the dry product; temperature reduction to maintain quality in dehydrated products; standard types of packages; packaging equipment and methods; substitutes for tin-plate containers; compression to high density for packaging; sanitation; control of insects and mites; the control laboratory; rehydration tests; quality testing; processing costs; and handling various vegetable and fruit crops.

Factors influencing quality of dehydrated carrots, B. Newcombe and D. C. Alderman (*Michigan Sta. Quart. Bul., 26 (1944), No. 4, pp. 341–345*).—In the dehydrated form, carrots grown on upland or mineral soil were superior in color and general appearance to those processed from muck soil; in storage at room temperature under CO_2 the carrots from muck soils were more susceptible to oxidative rancidity. Moreover, the fresh muck-grown carrots gave lower yields of the dehydrated product than did the fresh material from the upland soils. Preliminary trials indicated that storage of the dehydrated ground carrots under CO_2 rather than in air at room temperature did not result in improved keeping quality.

The appearance of white flakiness on the surface of the dehydrated carrot cubes was attributed to the roughening effect of the abrasive peeling, since hand-pared carrots showed but little flakiness and lye-peeled material remained clear and bright in appearance. Vitamin A determinations on a limited number of samples of fresh and dehydrated material suggested that the loss of vitamin A due to dehydration amounted to about 10 percent. A few recipes for the utilization of dehydrated carrots are presented.

What dehydrators of carrots should do to get quality, W. V. CRUESS. (Univ. Calif.). (*Food Indus., 16 (1944), No. 1, pp. 73–75, 129, illus. 3*).—Varieties found satisfactory from the standpoint of color of the dehydrated product and of yield; the effect of climate on raw carrot color and quality; methods of peeling, washing, trimming, and cutting; waste disposal; types of blanchers, drying trays, and dehydrators; drying, sorting, and packing; and sulfuring and sulfiting are phases of the problem discussed on the basis of practical experience and knowledge of the latest commercial practices. The treatment with bisulfite before dehydrating is recommended.

Effect of sulfiting on dehydration temperature, W. V. CRUESS, E. G. BALOG, H. F. FRIAR, and M. [LEW]. [Calif. Expt. Sta.]. (*Canner, 98 (1944), No. 5, p. 18*).—Commercial and laboratory experience with cabbage and laboratory tests with potatoes and onions indicated that treatment of these vegetables with a sulfite spray or dip (sulfite or bisulfite at concentrations of about 0.3–0.6 percent) before dehydration gave dried products of better color and flavor and permitted the use of drying temperatures 20° F. or more above those in commercial use (i. e., up to 155°–165°), thereby speeding up production. Sulfiting also greatly prolonged the storage life of dried products and rendered them less liable to heat damage through carelessness of workmen during the final stages of drying.

Sulfiting to improve vegetables for dehydrating, W. V. CRUESS, E. G. BALOG, H. F. FRIAR, and M. LEW. (Calif. Expt. Sta.). (*Food Packer, 25 (1944), No. 1, pp. 31, 62*).—Noted above.

Significance of peroxidase test in dehydrated potatoes, W. V. CRUESS, M. SMITH, and E. BALOG. (Univ. Calif.). (*Canner, 98 (1944), No. 6, pp. 13, 30*).—In laboratory tests conducted over a period of 2 yr., potatoes were blanched at temperatures ranging from 140° to 212° F., and then dehydrated at 140°. Comparison of the dried products shortly after dehydration and after storage at various temperatures, even after 1½ yr. at 90° in some cases, showed that all samples blanched sufficiently to prevent darkening during drying (blanching usually above 170°) but still showing a positive peroxidase reaction were equal to and, in some cases, superior to those which had been blanched sufficiently to destroy all peroxidase activity. In some products, the peroxidase reactions were strongly positive, and still the quality was good. It is considered, therefore, that the color of the dehydrated potatoes is a better index of keeping quality than is the peroxidase test. There should be no black spots or other oxidative discoloration.

How dehydration affects the nutritive value of fruits and vegetables, O. SHEETS (*Mississippi Sta. Cir. 113 (1943), pp. 4*).—This material has already been noted from another source (E. S. R., 90, p. 413).

A clinical and biochemical study of cow's milk and honey as an essentially exclusive diet for adult humans, M. H. HAYDAK, A. E. VIVINO, J. J. BOEHRER, O. BJORNDAHL, and L. S. PALMER. (Minn. Expt. Sta.). (*Amer. Jour. Med. Sci., 207 (1944), No. 2, pp. 209–219*).—In continuation of the series of studies of honey (E. S. R., 90, p. 139), five healthy individuals (four males and one female) from 22 to 44 yr. of age were maintained for periods of about 4 weeks' duration on a diet consisting of pasteurized milk in which had been incorporated 100 gm. of light mixed honey (sweet and white clover) per quart of milk. Each subject also re-

ceived a solution furnishing 65 mg. of ascorbic acid, 1 mg. of thiamine chloride, and 1 drop of 10-percent solution of KI daily. Three of the subjects underwent a second test. Control periods in which the subjects were on their customary diet alternated with the experimental periods. At the end of each control and test period, thorough physical and dental examinations were made, capillary fragility tests were performed, and 50 cc. of blood and a 24-hr. sample of urine were taken for analyses. Blood and urine samples were also taken during the middle of each test. Blood analyses included hemoglobin, calcium, inorganic phosphorus, magnesium, thiamine, riboflavin, ascorbic acid, pantothenic acid, and nicotinic acid; and urine analyses, the various vitamins. The quantity of milk and honey taken by each subject was used for calculations of the nutrients supplied in relation to recommended allowances.

Except for nicotinic acid and iron the subjects in the first experimental period ingested more than the minimum daily standard requirement. Submaintenance caloric intake was considered the cause of the inadequacies found. The blood values were within the limits of normal variations in most instances, with ascorbic acid somewhat low but within the reported limits of variation of normal subjects and with pantothenic acid and nicotinic acid low. There was no correlation between the intake of ascorbic acid and blood or urine values or between the number of petechiae and the blood and urine values, but a definite correlation was noted between the number of petechiae and the amount of ascorbic acid in the diet. Urinary excretions of riboflavin and pantothenic acid were normal, of nicotinic acid near the lower limits of the suggested range, and of thiamine definitely subnormal in spite of the thiamine supplementation of the diet. The gums were in a marked hyperemic condition. This is attributed to the physical character of the diet rather than dietary deficiency. "This diet proved to be adequate to support life, but not to prevent deficiency symptoms entirely."

Use of evaporated milk without added sugar for the feeding of infants, H. McCulloch (*Amer. Jour. Diseases Children, 67 (1944), No. 1, pp. 52–55*).—On the basis of the author's experience as a pediatrician, the advantages are discussed of the use in infant feeding of ordinary commercial unsweetened evaporated milk with no sugar or other carbohydrate added to the formula. Provided the milk is used in amounts sufficient to satisfy total caloric needs, nutrition and growth during the period of infancy are thought to be more uniform and satisfactory.

Standardizing the rat colony (*Connecticut [New Haven] Sta. Bul. 477 (1944), pp. 72–73*).—A recent summary of the performance of rats of the station colony confirms the findings of similar earlier surveys (E. S. R., 79, p. 275) that fluctuations in growth and reproduction performance may be expected and are not necessarily associated with any change in food supply.

Breeding records of rats fed certain diets containing meat, P. P. Swanson, W. E. Armstrong, and P. M. Nelson. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 17 (1943), No. 3, pp. 417–429, illus. 1*).—"The respective breeding record of four groups of rats maintained, when possible, for six generations on supposedly adequate diets containing partially dehydrated canned autoclaved pork or beef muscle incorporated in the rations in quantities equivalent to either 15 or 30 percent of protein have been studied. Complete reproductive failure characterized the response of the group fed the diets containing either beef or pork equivalent to 15 percent of protein. These diets, then, cannot be classed as nutritionally complete, although they, theoretically, carried all the essential food nutrients known at the time the experiment was initiated. However, experiments designed to check the adequacy of the basal pork diet have not furnished evidence to date that the ration is deficient in the recognized food nutrients. Increasing the quantity of pork in the diet effected very little improvement in the response of

the rats. On the other hand, the diet containing 30 percent of protein in the form of dried autoclaved beef supported life over six generations. At the end of that period, with the plan of breeding used, the 15 rats composing the original group were represented by 3,653 progeny in contrast to 528 produced by a similar group of rats fed the high-pork diet. Beef, therefore, possesses certain nutritive qualities not characteristic of pork. Although the study was originally planned to study the role meat may play in the nutrition of the rat when it serves as the chief protein constituent in an experimental ration supposedly adequate in all the essential nutrients, it did not contribute information to that end. Instead, the investigation has furnished data that support the hypothesis that there is a specific food nutrient that is preeminently important in the control of normal reproductive function. This nutrient is present in a limited amount in beef muscle."

Use of a germicidal quaternary ammonium salt in nutritional studies, L. J. TEPLY and C. A. ELVEHJEM. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 59–61, illus. 1*).—Preliminary observations are reported on the use of one of the quaternary ammonium salt germicides, Phemerol, in eliminating micro-organisms from the intestinal tract of rats to be used in nutritional studies. When this germicide was incorporated in the diet at a level as low as 0.1 percent, the rats refused to eat and soon died of inanition. However, it was found that the material could be administered in the drinking water starting with a 1–2,000 solution and gradually working up to a 1–1,200 solution. When the Phemerol in a 1–1,500 solution was used as a sole source of liquid by rats on a synthetic diet supplemented with essential vitamins except biotin, poor growth was obtained, but when whole liver powder was added to the extent of 5 percent excellent growth was secured. Addition of 2 percent solubilized liver extract only partially restored the growth rate on the biotin-free ration and further addition of biotin produced some growth response. A 1–2,000 solution of Phemerol was without effect over a period of several weeks.

The weight of Negro infants, H. BAKWIN and T. W. PATRICK, JR. (*Jour. Ped., 24 (1944), No. 4, pp. 405–407, illus. 1*).—A comparison of the weights of a group of 114 Negro infants (with a total of 679 observations) seen in private practice in New York City with earlier data on a group of white infants supervised from early life at the Fifth Avenue Hospital showed no significant differences in the weight gains of the two groups during the first year of life. "It seems likely that the slower growth observed in earlier studies was due to differences in socio-economic status rather than to differences in the nature of the germ plasm. Given the opportunity of proper medical supervision, Negro infants from moderate income families grow as well as white infants."

Food habits in Rhode Island, B. M. KUSCHKE (*Rhode Island Sta. Bul. 291 (1944), pp. 25, illus. 1*).—Essentially noted from a preliminary report (E. S. R., 88, p. 701).

The role of nutrition in preoperative and postoperative care, H. A. ZINTEL (*Amer. Jour. Med. Sci., 207 (1944), No. 2, pp. 253–258*).—This review, with more than 50 references to the literature, deals with the nutrients which most concern the surgeon in the light of their influence upon surgical patients. Protein is given the most attention, the other items including carbohydrate, fat, fluids, sodium chloride, and vitamins. Brief discussion of the diet in the preoperative preparation of patients with liver disease and of the importance of nutrition in gastric and duodenal surgery is included.

Availability of calcium in lady's finger (Hibiscus esculentus), cabbage (Brassica oleracea capitata), drumstick (Moringa oleifera), and amaranth tender (Amaranthus gangeticus), I, II, K. P. BASU and D. GHOSH (*Indian Jour. Med. Res., 31 (1943), No. 1, pp. 29–39*).

I. *Availability of calcium in vegetables determined by experiments on growing rats* (pp. 29–36).—In the experiments described, healthy young rats 4 weeks old were placed on four diets, in one of which all the Ca was supplied entirely by skim milk; in two others, the milk was entirely replaced by enough finely ground dried cabbage or lady's finger [okra] to provide the same amount of Ca; and in the fourth diet, half of the skim milk was replaced by enough ground dried drumstick to provide the same amount of Ca as in the milk diet. The Ca level in these diets was 0.34 precent; the P level 0.32, and the protein level 20.8–23.8 percent. At 8 weeks of age, the animals were killed and their bodies analyzed for calcium. "Comparison of the availability of calcium in these vegetables with that of milk was made by calculating for each an utilization factor which is the ratio of calcium retention to intake. The values for males were 0.87 for milk diet, 0.71 for lady's finger, 0.82 for cabbage, and 0.70 for drumstick diet. The values for females were respectively 0.84, 0.70, 0.81, and 0.69. Sex difference was, therefore, practically without any appreciable effect on the utilization. The calcium of cabbage was almost as well utilized as that of milk. The calcium from the other two vegetables, namely lady's finger and drumstick, was also fairly available. The rats refused to take the amaranth diet."

II. *Availability of calcium in vegetables determined by metabolism experiments on a human adult* (pp. 37–39).—"Calcium metabolism experiments were conducted on a healthy adult to find whether the calcium in lady's finger, cabbage, drumstick, and amaranth (leaves and tender stems) could be utilized to maintain the calcium equilibrium in human adults. These vegetables were given as supplement to two types of basal diets representing the typical Indian diets—one containing rice and fish and the other purely vegetarian. All the vegetables had a favorable effect on calcium balance and brought the Ca : P ratio to more favorable values. Amaranth, in spite of its high oxalate content, served as a fairly good available source of calcium. Comparison with milk showed that, except in the case of amaranth, the utilization of calcium in the vegetables was much lower than that of the calcium in milk."

Skeletal maturing in adolescence as a basis for determining percentage of completed growth, N. Bayley. (Univ. Calif.). (*Child Devlpmt., 14 (1943), No. 1, pp. 46+, illus. 36*).—"The left hands and knees of a group of adolescent children, 90 boys and 87 girls, were X-rayed nine times at 6-mo. intervals (at average ages of 14 to 18 yr.). Anthropometrics were taken at the same ages. Assessments of bone maturity, by means of the Todd standards, proved to be reliable. Skeletal ages based on the combined hand and knee assessments showed fairly consistent growth trends, the r for boys between ratings 3 yr. apart being 0.80. Comparisons have been made between skeletal maturing and rates of growth in size. When expressed as percent of a child's eventual mature size, his growth is seen to be very closely related to the development and maturing of his skeleton. This is shown to be true for the group as a whole, in several different ways. Standard deviations from the mean are seen to be much smaller when the cases are grouped according to skeletal age than when grouped according to chronological age. Correlations between different measures at each age group give higher r's with skeletal age, and when expressed as percent of mature size. Correlations for consistency in height over a period of years are greater between skeletal age groups. This also holds when comparisons are made among children who mature at different rates, though the late maturers seem to be least predictable—perhaps only because they are farther from their goal at any given C. A. In individual cases whose percentage height is not closely related to skeletal age, we could find little evidence that the disparity was due to other than chance factors. However, there is some indication that illness and glandular hypofunction may operate to retard skeletal

maturing and to effect growth in size. When curves of growth are expressed as percent of mature size at successive skeletal ages, we find a slight tendency for the late maturers to be a little nearer their mature height and the early maturers a little less so than the average—indicating a slight influence of other factors related to chronological age. When the sexes are compared in this way their curves of growth are seen to be remarkably similar. It appears that growth in size is closely related to the maturing of the skeleton. At a given skeletal age we may say that a child has achieved a given proportion of his eventual adult body dimensions. Consequently, mature size can be predicted with fair accuracy if a child's present size and skeletal age are known."

Effect of inositol upon rat alopecia, T. J. CUNHA, S. KIRKWOOD, P. H. PHILLIPS, and G. BOHSTEDT. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 2, pp. 236–238, illus. 2*).—Pregnant rats were placed about 3 to 5 days before term on a ration of natural feeds (ground yellow corn, soybean oil meal, and alfalfa meal) supplemented with $CaHPO_4$, NaCl, and $MnSO_4$ and with haliver oil two drops weekly. Three days after the young were born the mothers and litters were placed in five groups all receiving the basal ration unsupplemented for one group; supplemented with folic acid alone and with vitamin B_6 and with vitamin B_6 and inositol for three groups, respectively; and supplemented with inositol and vitamin B_6. The inositol supplement cured and prevented a widespread loss of hair observed in the animals on the diets not containing inositol. Growth was also promoted by the inositol and to a greater degree by the inositol and folic acid. It was concluded that the phytin present in the ration was either inadequate to supply the required inositol or that it was unavailable.

Role of inositol in alopecia of rats fed sulfasuxidine, E. NIELSEN and A. BLACK (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 14–16, illus. 1*).—Inositol is shown to prevent the onset of symmetrical alopecia in rats fed a synthetic diet with customary B vitamins but with sulfasuxidine added (E. S. R., 89, p. 505). The animals receiving the inositol also grew better and had a more tidy appearance. The complete replacement of the sucrose of the basal diet by lactose with and without the drug was without beneficial effect, and many early deaths and cases of kidney damage were noted. Increasing the casein of the diet by replacement of the sucrose was also without effect.

Effect of sulfonamides on coenzyme I-linked enzyme systems, E. G. ANDERSON, F. J. PILGRIM, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 39–41*).—Studies are reported briefly indicating that "sulfonamides do not interfere directly with the functioning of coenzyme I in yeast fermentation or in several systems in normal rat liver. The available experimental evidence does suggest the possibility that the drugs may inhibit the synthesis of the coenzymes."

Reproduction on purified rations containing sulfaguanidine, B. H. ERSHOFF and H. B. MCWILLIAMS (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 2, pp. 227–228*).—"Incorporation of sulfaguanidine at a 0.5-percent level in purified rations containing *p*-aminobenzoic acid had no deleterious effects on reproduction in the female albino rat; similarly animals raised on inositol-free rations with or without sulfaguanidine were not inferior in growth, reproductive performance, or gross appearance to litter mates on identical rations with inositol added. Addition of inositol, however, to a purified ration containing sulfaguanidine resulted in marked reduction of fertility, which did not occur if either inositol or sulfaguanidine were omitted from the ration."

The effect of preparation for freezing, freezing storage, and cooking on the vitamin content of vegetables, J. MCINTOSH (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 5, pp. 143–145, 149*).—This review summarizes briefly the

information from a number of studies on the effects of processing, storage, and cooking on the vitamin content of frozen vegetables and offers the following practical suggestions toward conserving the most of the nutritive value of these vegetables: "Harvest at optimum maturity and process immediately; use the correct blanching period for each vegetable; cool quickly after blanching, and package; freeze and hold vegetables at or below —18° C.; frozen vegetables may be defrosted to room temperature before cooking, but do not thaw completely or allow them to stand partially defrosted for any length of time; cook as quickly as possible in a small amount of water; serve immediately."

The carotene and ascorbic acid values of some wild plants used for food in New Mexico, E. M. Lantz and M. Smith (*New Mexico Sta. Press Bul. 989 (1944), pp. 3*).—Wild greens gathered near State College in the spring of 1944 were analyzed for carotene and ascorbic acid. Samples of these greens, identified botanically and including dock, pigweed, wild mustard, lambsquarters, and Russian thistle, contained from 66 to 166 mg. ascorbic acid per 100 gm.; dandelion, purslane, and sowthistle contained from 19 to 55 mg. per 100 gm. Carotene values ranged from 3 to 10 mg. per 100 gm. One sample of home-canned lambsquarters contained 68 mg. ascorbic acid and 25 mg. carotene per pint jar (liquid and solids). Wild rose hips, gathered in October and weighing about 0.4 to 0.7 gm. per hip, were particularly rich in ascorbic acid, containing from 713 to 1,278 mg. per 100 gm. analyzed with seeds and 1,084 to 1,368 mg. analyzed without seeds. Values of 448, 615, and 228 mg. per 100 cc. were obtained, respectively, for rose-hip juice, rose-hip purée, and rose-hip sirup stored approximately 4 mo.

Studies in fish-liver oils, I, II, S. P. Niyogi, V. N. Patwardhan, and B. N. Acharya (*Indian Jour. Med. Res., 31 (1943), No. 1, pp. 15–23, illus. 1*).

I. *The biological assay of vitamins A and D in ghol- (Sciaena miles) and mushi- (Scoliodon sorrokowah) liver oils* (pp. 15–20).—Vitamin A, determined tintometrically by the antimony trichloride reaction in freshly extracted liver oils of mushi and ghol, fish available in Bombay coastal waters, averaged 7,300 and 42,000 International Units per gram, respectively. The factor used to convert the blue values to I. U. was 4.2. Estimations of vitamin A by the rat-growth method gave values which agreed with the tintometric determinations in the case of mushi-liver oil, but were considerably lower (roughly 28,000-32,000 I. U.) for the ghol-liver oil. The vitamin D content, determined by the bone-ash method, was 97 and 575 I. U. per gram of liver oil from mushi and ghol, respectively.

II. *The seasonal variation in the yield and vitamin A content of some fish-liver oils* (pp. 21–23).—Monthly observations on the yield and vitamin A content of liver oils of four fish, namely mushi (*S. sorrokowah*), ghol (*Sciaena miles*), shengti (*Macrones gluilo*), and wagli (*Dasybatus imbricatus*) indicated that the yield of the oils varied from month to month in the case of each fish. The vitamin A content also showed wide variations, from about 2,000–9,000, 200–2,000, 7,000–19,000, and 7,000–14,000 blue units per gram, of these four liver oils, in the above order. "There was no definite relation between the yield of the oil and its vitamin A content in the case of mushi- and wagli-liver oils; but in the case of shengti and ghol, the vitamin A concentration was found to increase as the yield of the oil decreased. The relation between the two is given by the expression vitamin $A = K \log. P + C$ where P is the percent yield and K and C are constants which are different for the two oils."

The clinical significance of the plasma vitamin A level, H. Popper and F. Steigmann (*Jour. Amer. Med. Assoc., 123 (1943), No. 17, pp. 1108–1114, illus. 2*).—On the basis of reports in the literature and of observations on 2,673 vitamin A determinations on 454 patients, data on which are tabulated, the authors discuss the factors responsible for alterations in plasma vitamin A levels and the

clinical significance of plasma A determinations in diseases of adults. In normal nutrition under physiological conditions, the vitamin A level is said to be constant at certain times of the day and on consecutive days. In the absence of nutritional deficiency of vitamin A, low plasma values may be found in conditions associated with disturbances of intestinal absorption, with increased demand for the vitamin such as in pregnancy and malnutrition, with disturbed action of liver and blood, and with insufficient concentration of vitamin E or lipids. In liver disease the plasma vitamin A level is sharply lowered and in the course of recovery returns to normal of even higher levels. In infection, especially in lobar pneumonia, and certain other conditions such as anemia and gastrointestinal carcinoma the plasma A level is also lower, while in kidney disease the level is often greatly increased.

Effect of tocopherols and soybean phosphatides on utilization of carotene, J. L. JENSEN, K. C. D. HICKMAN, and P. L. HARRIS (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 3, pp. 294–296, illus. 1*).—Data are presented demonstrating graphically that the vitamin A-enhancing property of crude soybean phosphatides as announced by Slanetz and Scharf (E. S. R., 90, p. 134) was due chiefly to the tocopherols present in these phosphatides.

Hypervitaminosis A and carotenemia, H. W. JOSEPHS (*Amer. Jour. Diseases Children, 67 (1944), No. 1, pp. 33–43*).—The greater part of this paper is devoted to an extensive review of the literature on the results of overdosage with vitamin A and carotene in animals, clinical carotenemia, and clinical hypervitaminosis A. This serves as an introduction to a detailed report of a case of severe hypervitaminosis A occurring in a boy of 3 yr. who through the mistaken zeal of his mother had been receiving about 240,000 U. S. P. units of vitamin A daily since he was 3 mo. old.

"The condition was characterized by hepatomegaly, splenomegaly, hypoplastic anemia, leucopenia, increased serum vitamin A, increased serum lipids, advanced skeletal development, clubbing of the fingers, and sparse, coarse hair; it was accompanied with an abnormal appetite for halibut-liver oil, the source of the vitamin. Most of the symptoms cleared promptly when the excess vitamin A was removed from the diet."

Regulation of level of vitamin A in blood of newborn infants, J. M. LEWIS, O. BODANSKY, and L. M. SHAPIRO (*Amer. Jour. Diseases Children, 66 (1943), No. 5, pp. 503–510, illus. 1*).—In an extension of the authors' studies on the vitamin A levels in the blood of infants (E. S. R., 91, p. 98), it was shown from tests on 108 normal newborn infants that during the first 48 hr. of life there was a sharp drop in the vitamin A level of the plasma from an average initial value of 76 U. S. P. units per 100 cc. to 37 units, with a return on the fourth day to values averaging 61 units. In 11 infants given from 12 hr. after birth a special milk preparation in which the butterfat had been replaced by a vegetable oil, the plasma A values averaged 24 units at 1–3 days and 47 units at 6–9 days. This is thought to indicate delay in the mechanism of the transferring of vitamin A from the liver to the blood. That there was no failure in the absorptive power of the blood for vitamin A was shown by high plasma levels in infants of from 2 to 3 days of age 4 hr. after the administration of 2,500 units of halibut-liver oil.

"There is no evidence that a low level of vitamin A in the blood early in the newborn period brings about any pathologic disorder. The prevention of the marked lowering of the vitamin A content of the blood by frequent administration of a vitamin A concentrate therefore seems unnecessary."

The vitamin B_1 content of canned pork, E. J. REEDMAN and L. BUCKBY (*Canad. Jour. Res., 21 (1943), No. 8, Sect. D, pp. 261–266*).—Preliminary investigations showed that raw lean pork, when canned, was similar in moisture and in thiamine content to the commercially canned product prepared from lean pork trim-

mings and known as Canadian Spiced Pork and Canadian Spiced Ham. Investigations, therefore, were conducted on experimental export 6-lb. packs of vacuum-packed chopped lean pork, samples of which were analyzed for vitamin B_1 content before and after processing. Thiamine was determined by a method described and involving measurement of extracted thiamine as thiochrome in a photoelectric fluorometer. Preliminary incubation with pepsin and takadiastase was employed to liberate thiamine in the combined form. In several series the vitamin B_1 content of the 6-lb. packs averaged 20.7 (range 18.3–24.6) μg./gm. moisture-free basis before retorting and 9.8 (7.5–12.6) μg./gm. after retorting; the calculated losses of vitamin B_1 during the processing averaged 52.7 percent (55.3, 55.6, and 41.9 percent in the three series). "It was possible to fortify 6-lb. export packs of canned pork with synthetic thiamine to a level equal to, or above, that of the natural vitamin in raw meat. The destruction of synthetic added vitamin was no greater than that of natural vitamin under the conditions of this study."

Studies of the B vitamins in the human subject.—VII, Blood pyruvate and lactate-pyruvate ratio following the ingestion of glucose in experimental deficiency, D. Klein and K. O. Elsom (*Amer. Jour. Med. Sci., 207 (1944), No. 2, pp. 247–252*).—In this extension of a series (E. S. R., 88, p. 553), attention is called to a tendency to accept an increased concentration of pyruvic acid in the blood as diagnostic of early thiamine deficiency. Evidence is reported from tests conducted on five subjects in the same institution and under the same controlled conditions of the earlier studies showing that under the conditions provided blood pyruvic acid values as well as the ratio of blood lactate to pyruvate, both in the fasting state and following the administration of glucose, did not differ from the normal during subsistence on a diet deficient only in the B vitamins, even though manifestations of subclinical deficiency became evident in two of the subjects. These findings, together with previous evidence of the authors and of Williams et al. (E. S. R., 90, p. 566) of the accumulation of abnormally high levels of pyruvic acid and lactic acid in the blood following ingestion of glucose in severe deficiency, suggest that the test is of no value in indicating early deficiency in thiamine although useful in later stages provided other factors known to alter pyruvic acid concentration are ruled out.

Germinating seeds as a source of vitamin C in human nutrition.—I, Ascorbic and dehydroascorbic acid contents of several varieties of seeds germinating under standard conditions for varying periods of time, J. W. H. Lugg and R. A. Weller (*Austral. Jour. Expt. Biol. and Med. Sci., 21 (1943), No. 2, pp. 111–114*).—Seeds of wheat (*Triticum sativum*), beans (*Phaseolus vulgaris*), peas (*Pisum sativum*), and green gram (*Phaseolus mungo*) were germinated by a standard arbitrary procedure which involved preliminary soaking, followed by germination on wet cotton-wool or sand under labortory conditions of temperature (20°–25° C.) and light (3 footcandles for about 13 hr. of daylight), and the seedlings were analyzed for ascorbic acid and dehydroascorbic acid. Of the seeds tested, only the peas and the green gram were satisfactory with regard to high viability and production of much vitamin C upon germination. Their seedlings contained 0.35–0.38 mg. "total" ascorbic acid per gram of fresh tissue.

Questions about vegetables and fruit (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 5, pp. 20–21*).—Results of extensive trials demonstrated that freshly canned tomatoes are a good source of ascorbic acid and that in storage cold-pack tomatoes retain their ascorbic acid better than the hot-pack tomatoes. In 2 years' determinations, little difference in ascorbic acid was observed between the four varieties Orange King, Bison, Firesteel, and Bounty. Results of preliminary trials are summarized to show the amounts of riboflavin (moisture-free basis) in two varieties of peas, four varieties of beans, and Golden Bantam sweet corn in the raw, cooked,

and blanched states. Niacin is similarly reported for two varieties of beans and Golden Bantam sweet corn.

What is the effect of storage upon the vitamin C (ascorbic acid) content of North Dakota grown potatoes? (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 5, p. 22*).—Analyses of Irish Cobbler potatoes harvested in 1942 and stored under different conditions demonstrated that potatoes decrease in their ascorbic acid contents under storage. In one lot stored in a root cellar, ascorbic acid decreased from 98 mg. per 100 gm. of dry matter at harvest to 56 mg. after 45 days' storage and to 6 mg. after 195 days' storage. In two lots held in commercial storage, under forced ventilation in one case and under gravity flow ventilation in another, ascorbic acid decreased from an original 96 mg. per 100 gm. of dry matter at harvest to 44 and 50 mg., respectively, after 62 days of storage and to 5 and 8 mg., respectively, after 156 days.

Ascorbic acid in mashed potatoes, G. N. Jenkins (*Nature [London], 151 (1943), No. 3834, p. 473*).—Medium-sized potatoes boiled whole (peeled) in about a 2-lb. lot contained 5.4 mg. ascorbic acid per 100 gm. when cooked. Half of this lot when mashed and immediately sampled contained 5.0 mg. per 100 gm. Samples of mashed and whole potatoes were held in a water-heated double pan at 80°–85° C., and one sample of the whole potatoes was held at room temperature. The mashed potatoes when kept hot for 20, 30, and 135 min. were reduced in ascorbic acid content in these intervals, respectively, to 1.8, 0.5, and 0.4 mg. per 100 gm., whereas the whole potatoes in 20-, 60-, and 135-min. periods were reduced, respectively, to levels of 4.0, 2.5, and 0.9 percent. The whole potatoes held at room temperature for 135 min. still contained 4.3 mg. ascorbic acid per 100 gm. Other trials showed that there was little difference in the rate of ascorbic acid loss between vegetables kept hot in bulk and those kept hot in individual servings. In a large-scale cookery operation, where 10 min. were required to mash the potatoes by hand, the ascorbic acid content fell from 10.5 to 6.9 mg. per 100 gm. in the course of this operation. These results indicate that if potatoes are to be kept hot for some time before serving they should not be mashed, nor should they be mashed unless the process can be completed in 2 or 3 min.

Further studies on the relationship between the composition of the diet and the metabolism of ascorbic acid, I. Patterson and A. Bourquin (*Amer. Jour. Digest. Diseases, 10 (1943), No. 10, pp. 390–394*).—The effect of a diet high in protein on ascorbic acid metabolism was studied in two carefully controlled series of experiments on eight women subjects whose ascorbic acid excretion and saturation requirements were compared on diets of normal and high protein content. The difference between the average ascorbic acid excretion on the two diets was less than 2 percent, but the amount of ascorbic acid needed to saturate the subjects was somewhat greater on the high protein than the normal diet. These results, together with some evidence along several lines quoted from the literature, led the authors to conclude that "there is an indication of a greater requirement of ascorbic acid when protein metabolism is involved, and that it would appear prudent, from the point of safety, to increase the ascorbic acid consumption of a person living on a high protein diet, especially if saturation is desired."

The ascorbic acid saturation test, J. J. Engelfried and M. A. McWilliams (*Jour. Lab. and Clin. Med., 29 (1944), No. 3, pp. 324–328*).—In this preliminary report, data are given on the ascorbic acid excretion with or without test doses of various groups of adult subjects, the majority of whom were between 20 and 30 yr. of age. One group of 7 women and 8 men who had been having an abundance of fresh fruits and vegetables for at least a month were given a 200-mg. test dose of ascorbic acid and the urines collected during 4 and 6 hr. were analyzed for ascorbic acid. Minimum, maximum, and average values were 17.3, 71.6, and 27 mg.

for the 4-hr. and 27.9, 82.3, and 50 mg. for the 6-hr. test. A second group of 18 men with limited consumption of fresh fruits and vegetables gave average values of 3.2 and 5.13 mg. for the 4-hr. and 6-hr. tests. Four subjects suspected of a vitamin C deficiency gave an average 6-hr. excretion value of 6.55 mg. following the test dose. After receiving fruit juices furnishing about 200 mg. of ascorbic acid daily for 16 days, a retest gave an average of 118.3 mg. in the 6-hr. test. Another individual with a very low 6-hr. excretion of 3.8 mg. did not show improvement after receiving 50 mg. of ascorbic acid for 6 days and an increase to only 10.3 mg. after 29 days. On increasing the dosage to 75 mg., the response to the test dose 6 days later was 47 mg. Three individuals on an adequate vitamin C diet gave 24-hr. excretion values of 17.4, 4.7, and 3.7 mg., and corresponding values of 73.0, 52.8, and 55.9 mg. on the following day after taking a 200-mg. test dose. The authors conclude that a 6-hr. test (and probably a 4-hr. test) with a test dose of 200 mg. is satisfactory for indicating the status of ascorbic acid nutrition.

The assessment of vitamin C nutrition in man, F. T. G. PRUNTY and C. C. N. VASS (*Biochem. Jour., 37 (1943), No. 5, pp. 623–629, illus. 3*).—This discussion of the reliability of a single determination of plasma ascorbic acid concentration as a test for the vitamin C nutrition of a subject is based on data obtained from 50 subjects.

A comparison of urinary and plasma ascorbic acid concentration during extended saturation tests was made on 9 subjects, although data (considered typical of the results in general) are reported for only 2 subjects. These show in 1 case that the plasma ascorbic acid remains quite constant during prolonged saturation, while at the same time the urinary excretion shows marked fluctuations. In the other, an initial plasma concentration of 0 was accompanied by very low excretion with no point of sharp demarcation of excretion with increased plasma level. Somewhat later, in the same subject with an initial plasma level of 0.26 mg. per 100 cc. the urinary response to the test dose was very marked, the excess on the third day of the test dose rising from 5.73 to 23.10 mg. As some of the subjects never reached the point of excreting as much as 50 percent of the test dose, saturation was arbitrarily defined as the excretion of one-third of the test dose of 700 mg. per 140 lb. body weight administered in two equal doses at 12-hr. intervals. The time required for saturation as thus defined was shown to be closely correlated with the initial plasma level. The lower the level, the longer the time required. The curve shows the relationship between these two values was not linear. According to this curve, a plasma value greater than 0.8 mg. per 100 cc. denotes an intake more than sufficient to satisfy the body's requirements. Consequently, this level is considered to represent saturation. The maximum change in dosage required to produce saturation at a given plasma level occurred at a value slightly less than 0.4 mg. per 100 cc. From this it was concluded that a plasma value of not less than 0.4 mg. per 100 cc. "is compatible with a desirable standard of nutrition with respect to the vitamin." At a plasma level of 0.4 mg., 450 mg. of ascorbic acid per 140 lb. body weight was capable of bringing the subject to a state of saturation.

Ascorbic acid in tuberculous Navajo Indians, M. PIJOAN, B. SEDLACEK, ET AL. (*Amer. Rev. Tuberc., 48 (1943), No. 5, pp. 342–346; Span. abs., p. 346*).—Navajo Indians, numbering 66, confined to bed with moderately advanced tuberculosis at the Fort Defiance Sanatorium, served as subjects in this study of plasma levels of ascorbic acid before and after supplementation of the regular diet, calculated to furnish about 32 mg. of ascorbic acid daily, with ascorbic acid in amounts of 50, 75, or 150 mg. daily. The initial plasma values ranged from 0.24 to 0.85 mg. per 100 cc. with values less than 0.7 mg. in 47 cases and over 0.8 mg. in only 4 cases. Improvement in the plasma levels followed the administration of ascorbic acid, the extent of change being greater the lower the initial level. From a study

of the relationship of plasma changes in regard to initial levels, it is suggested that 74 mg. of ascorbic acid daily after initial saturation would be a fairly satisfactory ascorbic acid intake for subjects with tuberculosis of moderate degree.

In this study, the authors had the assistance of C. A. Elkin and R. L. Warren.

The effect of vitamin D from cod-liver oil and a tuna-liver oil upon serum phosphatase concentrations in rachitic infants, D. J. Barnes, B. Munks, and M. Kaucher (*Jour. Ped., 24 (1944), No. 2, pp. 159–166, illus. 2*).—Forty-eight infants with clinical rickets, as indicated by high serum phosphatase concentrations, were divided into groups and treated with vitamin D from cod-liver oil and a tuna-liver oil known to be only 62 percent as effective as cod-liver oil for chicks. The oils were administered at three dosage levels—600, 900, and 2,400 International Units daily. Serum phosphatase values, used as a criterion in diagnosing rickets and following the progress of healing of the rachitic lesion, showed a significant reduction upon administration of the oils for 6 weeks or even for 4 weeks, with one exception. There was, however, no significant difference in the magnitude of the reduction by either of the oils at any level, and when the three dose groups within the same oil were compared no significant difference was found in their degree of serum phosphatase reduction during the first 6 weeks of treatment. All approached normal values by the sixth week. "Under the conditions of this study it is indicated that 600 I. U. of vitamin D daily from cod-liver oil or some of the tuna-liver oils are ample as a curative dose for clinical rickets."

Vitamin E and length of life of rats fed a diet with fatally low protein content, H. Dam (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 55–56*).—Young rats maintained from a few days after weaning on a diet in which casein as the chief protein source was replaced by sucrose survived longer and reached a lower weight at death when the diet was supplemented with 10 mg. percent of *dl*-α-tocopherol acetate as a source of vitamin E than when the vitamin was not provided. No satisfactory explanation is offered for this difference beyond the possibility that the deficiency of two factors in the diet, protein and vitamin E, reduces the resistance of the animals more rapidly than deficiency of only one factor, protein, or that in the presence of vitamin E the low protein intake is somewhat better utilized.

Ariboflavinosis as a probable cause of vernal conjunctivitis, L. Castellanos A. (*Arch. Ophthalmol., 31 (1944), No. 3, pp. 214–216*).—The author expresses his belief that vernal conjunctivitis, which is described in its chronic and acute form, is due to a deficiency in riboflavin, "the deficiency being due to more rapid destruction of the vitamins by the ultraviolet rays of sunlight or to the demand for a greater quantity of this vitamin during the hot season." The treatment prescribed consists of one to three 1-mg. tablets of riboflavin daily and the consumption of liberal quantities of milk. It is noted also that when the symptoms become accentuated, symptomatic therapy is prescribed consisting of a few drops of a solution of 0.05 gm. of tetracaine hydrochloride and 15 drops of epinephrine hydrochloride (1:1,000) in 5 cc. of distilled water. With the treatment described, 35 patients showed improvement in all ocular symptoms on the third or fourth day; 62 patients showed improvement in from 10 to 15 days; the rest, 9 patients, did not return for examination.

Nutritional studies in tuberculosis, I, II, J. E. Farber and D. K. Miller (*Amer. Rev. Tuberc., 48 (1943), No. 6, pp. 406–411, Span. abs. p. 410; pp. 412–420, illus. 10, Span. abs. p. 420*).

I. *Prothrombin deficiency and vitamin K.*—Data are presented indicating prothrombin deficiency in 33 percent of 437 cases with pulmonary tuberculosis showing no blood streaking of the sputum and 53 percent of 116 with blood-streaked sputum. Synthetic vitamin K restored the plasma prothrombin concentration but

had no effect on the hemorrhage. It was thought that prothrombin deficiency in these subjects was a manifestation of a general nutrition deficiency.

II. *Niacin (nicotinic acid) and riboflavin deficiency.*—Approximately 400 patients with advanced pulmonary tuberculosis were examined for evidence on the tongue, lips, and mucous membranes of the mouth of niacin and riboflavin deficiency, and those showing glossitis, stomatitis, or cheilosis were given more careful study, including gastric analyses, blood counts, and serial prints and photographs of the tongue. One-fourth of the group showed definite changes characteristic of deficiency of these vitamins. The most frequently found form was glossitis, which occurred with the scarlet or beefy red tongue characteristic of niacin deficiency in 45 cases, of which 21 were pronounced and 24 moderate. Glossitis with a purplish red or magenta tongue characteristic of riboflavin deficiency was found in 20 (9 pronounced and 11 moderate), atrophy of papillae in 29 (17 pronounced and 12 moderate), and hypertrophy of papillae in 3. Ulcerations of mucous membranes characteristic of niacin deficiency were found in 7, cheilosis characteristic of riboflavin deficiency in 10, and evidence of combined niacin and riboflavin deficiency in 8. The lesions responded rapidly to proper diet and specific vitamin therapy. For recognized niacin deficiency, a minimum daily dose of 150 mg. of niacin increasing to as much as 500 mg. in severe cases is recommended, together with at least 1 oz. of brewers' yeast three times a day. For riboflavin deficiency, 6 to 15 mg. of riboflavin daily with yeast is recommended.

REPORTS AND PROCEEDINGS

Fifty-fourth Annual Report [of Arizona Station], 1943, P. S. Burgess and R. S. Hawkins (*Arizona Sta. Rpt. 1943, pp. 95+, illus. 12*).—In addition to a climatological summary, reports of progress are presented on the year's research on gypsum as a soil corrective; analyses of desert plants for rubber content, sugar beet leaves for boron content, and 42 samples of range grasses; protein and P_2O_5 content of alfalfa from Yuma Mesa; factors influencing the nodulation of soybeans in Arizona soils; mulching for Arizona soils; lysimeter studies on the nitrogen balance of arid soils; ground-water studies; duty of water for cotton; preservative treatment of tamarisk fence posts and growth of tamarisk planting for sawlogs; variety tests of cotton and soybeans; seed production of kok-saghyz (Russian-dandelion); green manures; culture of various legumes and guar; cattle fattening rations; warble control with a derris and sulfur spray; burroweed studies; range grasses; sugar beet seed production; daily v. weekly dismantling and cleaning of milking machines; serum solids content of Arizona milk; nutritive value and palatability of pasture crops; insect pests; citrus investigations; lettuce and cantaloup breeding and selection; lettuce fertilization; production of various other vegetables and vegetable seed; date and pecan investigations; vitamin C content of cantaloups, carrots, and citrus fruits; cotton and wheat breeding; diseases of guayule and other rubber-producing plants, field crops, and horticultural crops; and poultry breeding and feeding.

Annual Report [of New Haven Station] for the year ending October 31, 1943, W. L. Slate (*Connecticut [New Haven] Sta. Bul. 477 (1944), pp. 39–82, illus. 7*).—In addition to several articles noted elsewhere in this issue, progress reports are given on studies with the Japanese beetle; control of the Japanese long-horned weevil (*Calomycterus setarius*), the European red mite, and the apple maggot; the "stretching" of spray materials with diluents; new fungicides; injury to potatoes from bordeaux mixture; corn breeding; new vegetable varieties; digester sludge as a substitute for manure; plant nutrients in earthworm castings; effect of environment on growth of corn and potatoes; fertilizer needs of hybrid poplars;

forest composition in relation to soil sites; tobacco diseases, fertilizers, and breeding; and relative efficiency of nitrogen in various oil meals.

A year's work in the investigation of agricultural problems: Work of [Missouri] Agricultural Experiment Station during the year ending June 30, 1941, M. F. MILLER, S. B. SHIRKY, H. J. L'HOTE, ET AL. (*Missouri Sta. Bul. 477 (1944), pp. 67, illus. 2*).—Brief summaries are given on work in agricultural chemistry, agricultural economics, agricultural engineering, animal husbandry, botany, dairy husbandry, entomology, field crops, home economics, horticulture, poultry husbandry, soils, and veterinary science.

MISCELLANEOUS

The biological effects of X-rays as a function of intensity, A. A. BLESS. (Univ. Fla.). (*Natl. Acad. Sci. Proc., 30 (1944), No. 5, pp. 118–121, illus. 2*).

Mississippi Farm Research, [May-June 1944] (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), Nos. 5, pp. 8, illus. 7; 6, pp. 8, illus. 6*).—In addition to articles noted elsewhere in this issue and meteorological notes for May and June, respectively, these numbers contain the following:

No. 5.—The Value of Fertilizer for Corn, by R. Coleman (pp. 3–4, 5), also to be issued as a station circular; Employment of Rural Women in Industry Involves Problems, Family Decisions, by Dickins (p. 6); Prices of Farm Crops Continue to Increase (p. 6); Fertilizers for Young Tung Trees, by S. R. Greer (p. 7); Planning for Best Land Use Pays Off, Report 174 Farms, by C. D. Hoover (p. 7); and Treatment of Dairy Cows Having Infectious Mastitis, by W. C. Cowsert (p. 8).

No. 6.—Farm Land Market Activity in Mississippi, by D. E. Young, M. A. Brooks, and F. J. Welch (pp. 3–4, 7), and Saving Minerals and Vitamins in Vegetables and Fruits, by O. Sheets (pp. 5–6, 7), both of which are also to be issued as station bulletins; and Farm Prices Mostly Steady for Month, by D. G. Miley (p. 8).

Farm Research, [July 1, 1944] (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 3, pp. 16, illus. 8*).—In addition to articles noted elsewhere in this issue, this number contains Secrets of Soil Organisms Are Slowly Yielding to Science, by A. W. Hofer (pp. 3, 7) (N. Y. State Sta.); and Modern Bacteriology Is an Able Servant of Agriculture, by J. J. R. Campbell and J. M. Sherman (pp. 4, 10) ([N. Y.] Cornell Sta.).

Bimonthly Bulletin, [May-June 1944] (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 5, pp. 23, illus. 3*).—In addition to articles noted elsewhere in this issue and numerous short items, this number contains North Dakota Plants Related to Flax, Mallow, and Geranium, by O. A. Stevens (pp. 12–14).

Agriculture in the Americas, [July 1944] (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 7, pp. 121–140, illus. 19*).—In addition to articles noted elsewhere in this issue, this number contains Grasses of Brazil and Venezuela, by A. Chase (pp. 123–126); and Bamboo, by A. Lee (pp. 127–129, 137).

Soil Conservation, [May-June, 1944] (*U. S. Dept. Agr., Soil Conserv., 9 (1944). Nos. 11, pp. 241–264, illus. 20; 12, pp. 265–288, illus. 18*).—In addition to articles noted elsewhere in this issue, No. 11 contains Water and the Land, by M. W. Jones (pp. 243–245), and Soil Conservation Spreads Across the Land, by R. W. Rogers (pp. 246–251, 255); and No. 12, Range Conservation Pays Dividends, by R. V. Boyle (pp. 267–270, 282), Livestock in the Farm Woodland, by J. F. Preston (pp. 271–273, 279), and Range Management Contributes to War Effort, by K. Fiero (pp. 274–275).

NOTES

Alabama Station.—Dr. Paul D. Sturkie, associate poultry husbandman, has been appointed associate professor of poultry husbandry at Rutgers University and the New Jersey Stations vice Fred P. Jeffrey, resigned to have charge of the poultry department at the Massachusetts College.

Tuskegee Institute.—According to a note in the *Journal of the American Veterinary Medical Association,* a division of veterinary medicine is to be established.

Colorado College and Station.—Extensive work has been started on the mechanical processing of hay with a field hay chopper, adaptable for chopping green grass silage and dry hay. Several grass silages prepared with this forage machine are being used in experiments, including western wheatgrass, a mixture of yellow sweetclover and crested wheatgrass, and a volunteer stand of wheat and oats, with lettuce, sunflowers, and some alfalfa.

Chicks now on experiment have confirmed a previous finding that chloroform-extracted soybean meal is greatly inferior to unextracted meal in its growth-promoting activity. Neither the chloroform extract nor vitamin E added to this chloroform-extracted diet improved the growth of the chicks. Ether extraction of soybean meal, however, did not affect chick growth. Chicks are now being started on an experiment to test the goitrogenicity of fractions of soybean meal soluble in 0.1 N sodium hydroxide, as well as hatchability studies testing various soybean fractions for their effect upon reproduction.

Experiments to find a way to prevent liver abscesses in beef cattle are in progress. One phase of the project is designed to determine at what time during the fattening period the abscesses develop.

DDT experiments are under way on both fruit and field crops, and DD is being used in weed control experiments. Other new insecticides are also being tried.

Four carloads of old (1943 crop) potatoes, three carloads of new (1944 crop) potatoes, and one carload of potato meal are being utilized in a potato utilization project. Seven methods of drying and ensiling are under test, and feeding trials are under way with 132 heifers and 6 lots of hogs.

Dr. J. Lee Deen, station forester and dean of forestry and range conservation, has been given leave of absence for about 7 months to make a survey of forest resources in Colorado, Wyoming, Utah, New Mexico, and Arizona for the American Forestry Association. He will be assisted by J. C. H. Robertson, who will be employed on a part-time basis.

Inez M. Eckblad, college extension service nutritionist, has accepted a similar position in Hawaii. Marjorie McKean has been appointed assistant professor of home economics. H. H. Kob has been transferred from teaching to the station staff as assistant agricultural engineer.

Connecticut University and Storrs Station.—Dr. A. M. Porter, associate professor of vegetable gardening, has been granted leave of absence to become principal seed specialist with the U. S. Foreign Economic Administration. In this position he will be in charge of the distribution of seeds, fungicides, and insecticides to Allied and liberated countries.

Purdue University and Indiana Station.—Dr. Max R. Zelle, assistant professor and assistant in animal genetics, has been granted leave of absence to accept a commission in the United States Navy. Dr. Norman J. Volk, head of the department of agronomy and soils in the Alabama Polytechnic Institute and station, has been appointed head of the department of agronomy vice Dr. George D. Scarseth, resigned to become director of the American Farm Research Association Other appointments include Dr. H. R. Albrecht, associate plant breeder

in the Alabama Station, as associate in agronomy and Dr. G. Burton Wood as assistant in agricultural economics.

Kentucky University and Station.—Verna Latzke, assistant professor of home economics, has been granted leave of absence for service in the WAVES. Katharine Fried, seed analyst, Edith Grundmeier, assistant professor of home economics, and Dr. John R. Hardison, assistant in forage crop investigations, have resigned. Dr. J. D. Tiner has been appointed assistant veterinarian; Catherine P. Heflin, assistant in rural sociology; Lottie E. Sumner, assistant professor of home economics; and Mary C. Wooldridge, instructor in home economics.

New Mexico Station.—The resignations are noted of H. N. Watenpaugh, associate agronomist, to accept a position with the U. S. Bureau of Reclamation and H. D. Jones, assistant agronomist, to enter the employ of the U. S. D. A. Soil Conservation Service. G. W. Schneider, assistant horticulturist, has been granted leave of absence to enlist in the United States Navy.

Oklahoma College and Station.—The college and station are now under supervision of a nine-member board of regents provided for in a constitutional amendment adopted at an initiative election on July 11. Previously the State Board of Agriculture had acted as board of regents. Under the new plan one member of the new board is appointed annually by the Governor for a 9-year term, and the president of the Board of Agriculture, popularly elected for a 4-year term, is ex officio a member of the board.

Development of a large-scale experimental range unit is nearing completion on a 4,500-acre tract of the Lake Carl Blackwell land use area, under long-time lease from the U. S. Department of Agriculture. Fifteen pastures, with two weighing centers and a third planned, permit controlled grazing tests on a scale comparable to commercial practice. The area includes both virgin grassland and abandoned farmland. Tests under way include regrassing, grass improvement, and grass utilization.

Horace S. Smith, first lieutenant in the United States Marine Corps, has been reported killed in action on Guam, July 21. As assistant agronomist since 1940, he was in charge of the Oklahoma farm wheat improvement program prior to entering military service.

Bruce R. Taylor, associate professor in animal husbandry, has resigned to become field man for the American Hereford Association.

Oregon College.—Dr. Fred F. McKenzie has been appointed professor of animal husbandry.

Virginia Station.—T. W. Edminster, assistant agricultural engineer, has resigned to accept a position with the U. S. D. A. Soil Conservation Service.

Wisconsin University.—The twenty-third annual Town and Country Leadership School, held at the university from July 10 to 21, had a record attendance of 120 rural pastors and other leaders, representing 7 denominations and 24 States and Canada.

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A source book of agricultural chemistry, C. A. BROWNE. (U. S. D. A.). (*Chron. Bot., 8 (1944), No. 1 pp. 290+, illus. 34*).—The author states his purpose in the writing of this book as that of giving an account, more accurate and complete than has hitherto appeared, of the origins of agricultural chemistry and of the relationships of Liebig's work to that of his predecessors. "In doing this he [the author] has preferred so far as possible to let these predecessors in selected passages give their own accounts of the work selected for description, with no attempts at modernization of language. This volume is therefore primarily a source book, and while there can be a just difference of opinion in the choice of selective material, it is hoped that the various quotations and translations submitted will give the reader a good general perspective of developments in the history of agricultural chemistry from early beginnings down to the time of Liebig."

The endosperm content of wheat, P. HALTON and E. BARTON-WRIGHT (*Jour. Soc. Chem. Indus., Trans. and Commun., 62 (1943), No. 8, pp. 123–124*).—The endosperm content of the wheat berry was determined by two methods, one chemical, in which treatment of the wheat with normal lactic acid served to soften and disperse the endosperm, and the other biological, wherein the endosperm was consumed by the grain weevil *Calandra granaria,* leaving only the bran coats and the aleurone layer and germ. Determinations by the two methods were in agreement and for seven normal wheats of this region the endosperm content averaged about 86 percent. It is pointed out that the endosperm with germ constitutes about 88 percent of the wheat berry available for production of a bran-free National flour (85-percent extraction) and that certain millers are now able to produce a flour of 0.3-percent fiber content, this representing a bran content of 2.5 percent and indicating that the milling process is collecting 82½ parts of the 88 parts of endosperm and germ.

The occurrence of some previously unreported fatty acids in peanut oil, H. L. WIKOFF, J. M. KAPLAN, and A. L. BERMAN. (Ohio State Univ.). (*Jour. Biol. Chem., 153 (1944), No. 1, pp. 227–235, illus. 2*).—Caprylic and lauric acids were isolated for the first time from peanut oil. The presence of myristic, palmitic, stearic, arachidic, behenic, lignoceric, oleic, and linoleic acids, previously reported as occurring in peanut oil, was confirmed. The oleic acid found was the 9–10 isomer.

[1] The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

Rennin action in relation to the water binding and electrokinetic properties of calcium and sodium caseinate sols, C. L. HANKINSON and L. S. PALMER. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 26 (1944), No. 11, pp. 1043–1056, illus. 4*).—The results here recorded include measurements of electrokinetic potential (ζ), specific conductivity (λ), relative viscosity, $\frac{\eta_s}{\eta_0}$, and pH measurements on various caseinate systems treated with salts, rennin, and pepsin. Calculations from the data are shown graphically to aid in evaluating effects on hydration and electroviscosity.

The addition of increments of rennin to calcium and sodium caseinate systems at pH 6.6 reduced the relative viscosity, ζ-potential, and pH, and increased the specific conductivity at varying rates and to varying degrees. The primary effect of rennin on calcium caseinate systems appeared to be a true dehydration with a secondary decrease in ζ-potential, both effects contributing to the decreased stability of the system. The effect of rennin on sodium caseinate was found to be principally one of dehydration. The course of action was the same for a single high concentration of rennin measured at succeeding time intervals as for a series of increasing levels of rennin measured when equilibrium had been reached. Rennin action followed the same course in dialyzed calcium caseinate-calcium phosphate milks as in calcium caseinate sols, even though, initially, the former was apparently not as highly hydrated as the latter. Dialyzed skim milk was found an unsuitable substrate for the study of rennin action by the methods employed. The order of destabilizing effect on a calcium caseinate sol was found to be: Purified rennin > rennet extract > pepsin. The manner of destabilization by pepsin was different from that of rennin. The proportion of pepsin in commercial rennet extract was insufficient to influence the results obtained in this study. Rennin exhibited a progressive increase in negative ζ-potential from pH 6.0 to pH 7.5, the zone studied. Both rennin and calcium caseinate systems showed the same sign and approximately the same magnitude of ζ-potential at pH 6.5.

Effect of acylating agents on the sulfhydryl groups of crystalline egg albumin, H. FRAENKEL-CONRAT. (U. S. D. A.). (*Jour. Biol. Chem., 152 (1944), No. 2, pp. 385–389*).—At pH 5–6, phenyl isocyanate and carbon suboxide were found to react with the thiol groups in preference to the amino or phenolic groups of crystalline egg albumin. Ketene treatment caused more rapid acetylation of the amino groups than of the thiol groups. The thio esters formed by any of these reagents were hydrolyzed by alkali at room temperature, permitting almost complete recovery of the protein thiol groups. Such reversible acylation of sulfhydryl groups was also demonstrated in experiments upon cysteine and glutathione.

General characteristics of the partial hydrolysis products from the action of proteolytic enzymes on casein, T. WINNICK. (Univ. Idaho). (*Jour. Biol. Chem., 152 (1944), No. 2, pp. 465–473*).—The author reports upon a study of the partial hydrolysis products from the action on casein of the enzymes pepsin, trypsin, chymotrypsin, ficin, papain, and carboxypeptidase.

After digestions with proteases, the average nonprotein molecules contained from five to seven amino acid residues, with 1.5–4.5 percent of the total nitrogen in the form of free amino acids. After the removal of inorganic electrolytes in electrodialysis, some additional characteristics of the digestion products were determined, including the nitrogen content, specific rotation, and average molecular weight. The further action of carboxypeptidase on protease digests of casein was interpreted as the splitting of free amino acids from the ends of polypeptide chains. The initial products from short periods of protein digestion were compared with those from prolonged protease action. The specific rotations and ratios of amino to total nitrogen of the products did not differ significantly in these two experiments.

The influence of dextrin upon the synthetic action of plant phosphorylase, J. B. SUMNER, G. F. SOMERS, and E. SISLER. (Cornell Univ.). (*Jour. Biol. Chem., 152 (1944), No. 2, pp. 479–480*).—The authors find that the nature of the product synthesized from Cori ester by plant phosphorylase depends upon the kind and proportion of carbohydrate added to prime the reaction. A small quantity of achroodextrin will lead to the production of a substance giving a blue color with iodine. A larger quantity of achroodextrin will cause to be formed a product which gives a red color, while addition of much achroodextrin will cause the production of a substance that gives no color with iodine. In each case the quantity of inorganic phosphate liberated is practically the same. The authors believe that the enzyme adds anhydro-*d*-glucose molecules to the foundation it finds. If a few dextrin molecules are present, it forms chains sufficiently long to give a blue color with iodine. If there are many dextrin molecules, the phosphorylase forms many polysaccharide chains of intermediate length and the product resembles erythrodextrin. It is possible with phosphorylase preparations which contain amylase that the starch formed will be degraded to erythrodextrin as fast as it is formed. The authors' potato phosphorylase has been found to be free from amylase, however.

A quantitative study of the adsorption of estrone, estriol, and α-estradiol on a chromatographic column, B. F. STIMMEL (*Jour. Biol. Chem., 153 (1944), No. 1, pp. 327–333*).—The distribution of the three estrogens after adsorption on a column of activated alumina, both singly and in mixtures, in a series of solvents having increasingly powerful eluent actions was investigated. The data presented demonstrate the utility of the liquid chromatogram in the quantitative separation of the strongly phenolic estrogen (estriol) from the weakly phenolic estrogens (estrone and α-estradiol).

Studies on the hemorrhagic sweet clover disease.—XIII, Anticoagulant activity and structure in the 4-hydroxycoumarin group, R. S. OVERMAN, M. A. STAHMANN, C. F. HUEBNER, W. R. SULLIVAN, L. SPERO, D. G. DOHERTY, M. IKAWA, L. GRAF, S. ROSEMAN, and K. P. LINK. (Wis. Expt. Sta.). (*Jour Biol. Chem., 153 (1944), No. 1, pp. 5–24*).—Of the 4-hydroxycoumarin class of compounds, 3,3′-methylenebis (4-hydroxycoumarin) is rated the most potent anticoagulant for rabbits under the experimental conditions specified. It was further found that the minimum structural requirements for activity are an intact 4-hydroxycoumarin residue, with the 3 position substituted by a carbon residue or a hydrogen atom. For high anticoagulant potency the bis-4-hydroxycoumarin molecule or a 4-hydroxycoumarin with the 3-substituent containing a keto group in the 1,5 position with respect to the 4-hydroxyl group is necessary.

Rapid microchemical soil tests, M. PEECH and L. ENGLISH. ([N. Y.] Cornell Expt. Sta.). (*Soil Sci., 57 (1944), No. 3, pp. 167–195*).—A critical examination of the rapid microchemical soil tests in current use showed many of the tests to be subject to serious analytical errors. Among inherent technical difficulties, interferences by diverse ions were found to cause sufficiently serious errors to invalidate the results in many instances. These interferences in the tests were thoroughly investigated and were obviated by the development or the adoption of more specific reagents and by use of competitive complex formers. The accuracy as well as the working range of the tests, particularly those utilizing color lake formation, was considerably increased by introduction of protective colloids. The resulting accurate and reliable microchemical soil tests, suitable for practical routine soil testing, are here presented, together with a discussion of interferences and other inherent analytical errors encountered. The applicability of these tests to the examination of soil solutions, aqueous extracts, and plant tissue extracts is also discussed.

The soil is extracted with Morgan's sodium acetate-acetic acid solution (E. S. R., 77, p. 302) at pH 4.8. The removal of soluble organic matter is effected by the use of activated carbon in the extraction process. All tests are then made directly on the separate aliquots of the filtered extracts without preliminary separation or treatment. The quantities of the different constituents are determined by comparison with a series of standard solutions carried simultaneously through the tests. Calcium is estimated turbidimetrically as calcium stearate, a special reagent for these purposes having been devised to overcome flocculation and other difficulties; magnesium, colorimetrically by means of titan yellow; potassium, turbidimetrically as potassium-sodium cobaltinitrite; manganese, colorimetrically after oxidation with bismuthate; iron, colorimetrically by *o*-phenanthroline; aluminum, colorimetrically by aluminon (aurintricarboxylic acid); phosphate, colorimetrically after reduction of the phosphomolybdate with stannous oxalate; ammonia, colorimetrically by direct nesslerization; and nitrate, colorimetrically by brucine.

Development and use of a powdery indicator for rapid and accurate estimation of soil reaction, C. PENG and T. S. CHU (*Soil Sci., 57 (1944), No. 5, pp. 367–369*).—The authors prepared a mixed indicator from 0.1 gm. each of bromocresol green, bromocresol purple, and cresol red, ground together with 5.9 cc. of 0.1 N NaOH and a few cubic centimeters of distilled water and the mixture diluted to 400 cc. in buffer solutions ranging by steps of 0.4 pH from 4.0 to 9.2. The colors observed ranged from orange brown to greenish yellow, green, greenish blue, and bluish violet.

To render this reagent suitable for field use, a concentrated solution of the new indicator was mixed with pure neutral barium sulfate, adjusted to pH 6.8, evaporated to dryness on the steam bath, and ground to pass a 100-mesh sieve. In order to fix the indicator on the barium sulfate, a dilute collodion solution was added to the mixture, which was then dried and reground. In using the indicator about 0.5 gm. of soil was moistened with about 1 cc. of distilled water, and stirred well. By means of the tip of a glass rod, a drop or two of the soil suspension was transferred to a white porcelain plate and spread evenly so that a film about 1 cm. square and 0.5 mm. thick was formed. The powdery indicator, contained in a vial capped with a 100-mesh brass screen, was carefully dusted on the moist film of soil suspension so that the color of the soil was just covered. About 0.01 gm. was enough for each determination. After 5 min. the color developed was compared with a painted color standard. Results for the most part very close to those of an electrometric determination are shown.

Reliability of the pressure-membrane method for extraction of soil solution, R. F. REITEMEIER and L. A. RICHARDS. (U. S. D. A.). (*Soil Sci., 57 (1944), No. 2, pp. 119–135, illus. 2*).—The authors report upon investigations of the pressure-membrane method for the extraction of soil solution and discuss technic of operation, recent modifications in the apparatus, and such factors affecting the method as pressure and composition of the gas, choice of a suitable membrane, and rate of extraction.

Solutions obtained from a variety of soils remained uniform during the extraction period. Minor deviations in some ions may result from membrane filtration effects and the presence of insoluble carbonates, but these discrepancies can be minimized or eliminated by analysis of the extract in fractions. At each moisture content a solution which is representative of that condition is obtained. Comparisons with the aqueous displacement method on 13 soils indicated that the two methods supply substantially identical solutions. The method is found to be adapted to wide ranges of moisture, salinity, and texture.

Rapid colorimetric determination of soil organic matter, S. A. WILDE. (Univ. Wis.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 393–394*).—The author describes

a modification of the Schollenberger method (E. S. R., 65, p. 504), the acid being a mixture of 4 parts per volume of sulfuric acid with 1 part of 85 percent phosphoric acid in place of the usual undiluted sulfuric acid. A standard solution of potassium dichromate is used. Colorimetric comparison is made against a permanent scale made from "cellulose acetate paper" of various colors. The scale, in turn, was standardized against known quantities of dextrose, oxidized in accordance with the procedure used for soil sample digestions. The method being intended as a rapid soil test, measuring of the air-dried soil with a sample spoon calibrated to contain either 0.25 or 0.5 gm. is prescribed instead of weighing out the samples. Accuracy to about 0.2 percent appeared to be obtainable.

Hydration control of montmorillonite as required for its identification and estimation by X-ray diffraction methods, D. G. Aldrich, N. N. Hellman, and M. L. Jackson. (Wis. Expt. Sta.). (*Soil Sci., 57 (1944), No. 3, pp. 215–231, illus. 4*).—To differentiate montmorillonite from hydrous mica and make possible the quantitative estimation of these minerals in clay samples by means of the X-ray diffraction procedure, it was found necessary to control the degree of hydration of montmorillonite more closely than previously was thought necessary. Too high or too low hydration of montmorillonite results in diffraction lines at 10 or 12 a. u. spacing, i.e., in the position of characteristic hydrous mica lines. To avoid the formation of these lines by montmorillonite so that the quantities of montmorillonite and of hydrous mica in clay may be judged by their characteristic lines, fine clay (particles less than 0.2μ in diameter), conditioned and saturated with calcium, is suspended in a ternary solution of benzene, ethanol, and water, the composition of which is such as to provide true solution but a close approach to saturation with respect to water, and benzene is added to the suspension, resulting in setting free a water-rich second phase in finely divided form throughout the suspension so that it is sorbed uniformly by all of the clay. The quantity and composition of the ternary solution in which the clay is suspended, and the quantity of benzene later added, are suitably adjusted so as to expel the required quantity of water (50 percent of the dry weight of the clay) and still maintain a suspension medium which is largely benzene. Most of the supernatant liquid is decanted, and the clay dried under controlled conditions (30° C. and 65 percent relative humidity).

The clay thus treated dries to an incoherent powder, somewhat softer than that resulting from drying the clay from anhydrous benzene. The advantages of drying from a liquid of low polarity are retained and improved upon, even though small quantities of water have been added. The sample in the incoherent physical condition readily reaches equilibrium at any desired relative humidity. A portion of the dried clay is mounted in the receptable so as to give a definite volume-weight for X-raying, and then is humidified for about 15 hr. in a desiccator maintained at 92 percent r. h. and later X-rayed at this humidity. Special equipment for this humidification is described. It was found that a maximum intensity of the characteristic 16 a. u. (001) diffraction line of montmorillonite is produced by this procedure. Diffraction patterns of a number of representative soil clays show clearly defined montmorillonite lines, even in the diffraction patterns of clays made up largely of hydrous mica and kaolinite.

The microbiological determination of amino acids.—I, Valine and arginine, J. R. McMahan and E. E. Snell (*Jour. Biol. Chem., 152 (1944), No. 1, pp. 83–95, illus. 2*).—The authors describe medium and procedure for the quantitative determination of valine and arginine in protein hydrolysates, based upon the observation that these amino acids are essential for *Lactobacillus casei* and *L. arabinosus.* It is claimed that this method is accurate, is applicable to the detection of minute amounts of amino acids, and requires no extensive pretreatment of the protein hydrolysate; and that by suitable modifications of the basal medium and the use of a number

of organisms the procedure is applicable to determination of several other amino acids. Possible variations and applications of the technic are discussed.

A method for the determination of glutamic acid in proteins, H. S. Olcott. (U. S. D. A.). (*Jour. Biol. Chem., 153 (1944), No. 1, pp. 71–82*).—A method for the quantitative determination of glutamic acid in proteins is based upon a measurement of the loss in amino nitrogen occasioned by the transformation of glutamic acid to pyrrolidonecarboxylic acid at 125° [C.] and pH 3.3. Approximately 92 percent of the glutamic acid is converted in 4 hr. Of a number of amino acids investigated, only cystine interferes. The magnitude of the correction necessary for cystine was determined. No evidence for anhydride formation in protein hydrolysates during autoclaving was obtained. The method is applicable to the determination of glutamic acid in samples ranging from 25 to 100 mg. of protein when the Van Slyke manometric apparatus (E. S. R., 26, p. 22) is used.

The glutamic acid content of a number of proteins was determined, most of the results agreeing with previous reports. Insulin was found to contain approximately 20 percent of glutamic acid, gelatin 12, glutenin 36, chicken feathers 12, cottonseed globulin 20, and tobacco mosaic virus 17 percent.

Interfering substances in the determination of phosphoglycerol, G. A. LePage. (Univ. Wis.). (*Jour. Biol. Chem., 152 (1944), No. 3, pp. 593–597*).—The authors examined a periodate method for the estimation of phosphoglycerol, finding it not specific for this material and interfered with by glucose-6-phosphate, fructose-6-phosphate, and ribose-5-phosphate.

The hydrolysis of cystine and the fractionation of sulfur in plant tissues, M. D. Thomas and R. H. Hendricks (*Jour. Biol. Chem., 153 (1944), No. 1, pp. 313–325, illus. 1*).—Analysis of cystine by mild alkaline digestion in the presence of a cadmium salt, followed by acidification and evolution of hydrogen sulfide in the reaction flask or by filtration and oxidation of the cadmium sulfide, was studied, with many variations of the procedure.

A cadmium salt was found the most efficient collector of sulfide. Hydrolysis of cystine was nearly complete in 12–20 hr. After acidification, and depending on the weight of cystine digested, 66–78 percent of the sulfur was evolved as sulfide—6–19 percent as sulfur dioxide—and 4–9 percent was oxidized to sulfate. Lower yields with larger samples seemed due to formation of stable organic compounds during the evolution process. Iodometric titration of the evolved gases was found a convenient and accurate method of analysis. The results agreed well with bromometric and gravimetric methods. When the cadmium sulfide was filtered off and oxidized, nearly all the sulfur was accounted for as sulfide (including sulfite) and sulfate even with the larger samples of cystine. Hydrolytic reactions were found to account for the deamination of the cystine and also for the production of sulfide and pyruvic acid.

The digestion method was applied to leaf tissue and the sulfur partitioned into "labile" or "cystine" surfur, sulfate, soluble organic sulfur, and insoluble organic sulfur. The results were shown to be reproducible.

A study of the ether extract of the materials estimated as fat in the Babcock test of milk, E. O. Herreid, R. Jenness, and D. W. Whitman. (Vt. Expt. Sta.). (*Jour. Dairy Sci., 26 (1943), No. 9, pp. 883–891*).—When 15 cc. of sulfuric acid were used in the Babcock method, the ether extracts of the materials estimated as fat from the four sources showed quantitative uniformity. It was established that 17.5 cc. of acid of specific gravity 1.82–1.83 yields higher fat estimations but, because of the inclusion of more acid and charred impurities, lower percentages of ether extract, as compared with those yielded by 15.0 cc.

The method of obtaining the fatty materials affected the amount of ether extract. When 15.0 cc. of acid were used, aspiration of the fatty materials into the extrac-

tion flasks in 68 trials resulted in an averaged recovery of 98.4653 percent ether extract, while removal by breaking off the bottle neck in 28 trials resulted in an averaged recovery of 98.1080 percent. Similarly, when 17.5 cc. of acid were used, the recovery of ether extract was 98.0259 percent in 16 trials by aspiration and 96.7733 percent in 10 trials by the method of breaking off the bottle neck. Approximately 57 percent of the acid impurities in the fatty materials in the Babcock "fat" column were soluble in ether, as judged by the acid number of this material and that of its ether extract in comparison with the acid number of butterfat. Use of 17.5 cc. of sulfuric acid yielded larger amounts of acid impurities in the fat column than use of 15.0 cc.

As between the Babcock and Mojonnier methods, on an ether extract basis, a difference of 0.1501 percent in favor of the Mojonnier method was established.

A microtitration method for the determination of small amounts of citric acid, G. W. PUCHER. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem., 153 (1944), No. 1, pp. 133–137*).—A microtitration method has been developed for the estimation of small amounts of citric acid, which is recommended as a substitute for the earlier colorimetric method of Pucher, Sherman, and Vickery (E. S. R., 76, p. 585). The new procedure is independent of those factors which necessitate a frequent checking of the calibration curve used in the colorimetric procedure. Essentially, the new procedure follows the old to the point of the decomposition of the pentabromoacetone by sodium sulfide, but replaces the colorimetric reading by a washing out of the inorganic halides from the petroleum spirit solution, boiling out of the hydrogen sulfide after acidifying the extraction, and titration of the inorganic bromide with 0.01302 N ammonium thiocyanate from a microburette. It was found possible to estimate as little as 0.05 mg. of citric acid with an accuracy of ± 5 percent, and the new procedure may be applied equally as well as the old to the analysis of trichloroacetic acid filtrates obtained from animal tissues and to the organic acid fractions prepared from plant tissues.

Extraction of oil and vitamin A in shark liver analysis: The xylene-centrifuge method, V. M. SYCHEFF (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 2, pp. 126–127*).—"Xylene as a low-density solvent for the simultaneous centrifugal extraction and determination of oil and vitamin A is advocated for mass routine analysis of shark livers. The solvent need not be removed prior to the colorimetric determination of the vitamin by the Rosenthal-Weltner method. Moreover, the precision of the method for both oil and vitamin A is from 1 to 2 percent for most samples encountered during a large routine run."

Determination of vitamin A and carotene in milk: A rapid extraction procedure, P. D. BOYER, R. SPITZER, C. JENSEN, and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 2, pp. 101–102*).—The method described in detail as to reagents and procedure consists in general in mixing 2 volumes of milk with 3 volumes of alcoholic KOH and allowing to stand at room temperature for 3 hr. The mixture is then extracted twice with ether, under definitely specified conditions, and the vitamin A and carotene are determined by means of the Carr-Price reaction with the aid of an Evelyn photoelectric colorimeter. With the method described, good recovery (95 percent or better) of vitamin A alcohol added to the original milk was obtained, as compared to the same amount of vitamin A added to the final washed extract. The carotene and vitamin A values obtained by the double-extraction procedure applied to pasteurized and raw milks from cows of various breeds agreed very well with values obtained for the same samples extracted by the procedure of Olson et al. (E. S. R., 81, p. 269). A single extraction, rather than the double-extraction procedure recommended, occasionally gave low results.

Determination of vitamin A and carotenoids in butterfats. Comparison of direct spectrophotometry with filter photometry and use of the antimony trichloride reaction, F. P. Zscheile, H. A. Nash, R. L. Henry, and L. F. Green. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 2, pp. 83–85*).—This paper compares the results of the direct spectroscopic method and those obtained by colorimetry in the assay of the six representative samples of butterfat. These samples were sent out for collaborative work in connection with the comparative study of methods for the determination of vitamin A and carotinoids in butter by the Technical Committee on Vitamin A Research in cooperation with the National Cooperative Project, Vitamin A Potency of Market Butters. The procedure, conducted in the authors' laboratory, involved preparation of the butter extract by saponification of the sample with alcoholic (aldehyde-free methanol) KOH and extraction of the nonsaponifiable fraction with peroxide-free diethyl ether. For the spectroscopic observations, wavelengths of 3,240 and 4,370 a.u. were used for vitamin A and total carotenoids, respectively. The spectroscopic methods and instrument were those employed in an earlier study (E. S. R., 88, p. 8). For the antimony trichloride method, two aliquots of the ether extract were used. The ether was evaporated from the one aliquot, the residue taken up in Skellysolve B, and the carotene extracted with aqueous methanol or diacetone alcohol and determined by measurement of transmission in the 440 μ region with a photolectric filter photometer. For the vitamin A determination, the ether was evaporated from the other aliquot and the residue taken up in chloroform. Color was developed by treatment with the antimony trichloride reagent added under carefully controlled conditions and the transmission in the region of 620 μ determined with the photometer. The transmission reading was corrected for the reaction of carotene with the reagent.

Analyses for total carotenoids as determined on the same butterfats in seven laboratories are reported, together with the respective deviations from the mean for each sample. From the total of 42 determinations, only 5 deviated from their corresponding means by more than 7 percent, the maximum deviation being 13.3 percent. In general, this was very satisfactory agreement among the various laboratories, particularly when the difference in standards is considered. Vitamin A results obtained by the four collaborators employing crystalline vitamin A alcohol as reference standards and reporting in terms of unit weights are summarized. Among the 18 results from the collaborators using the colorimetric method, deviations from the mean were 8.15 percent or less, with an over-all mean absolute deviation of 3.34 percent. The corrected results from direct spectrophotometry (the method utilized by the authors) had mean absolute and maximum deviations two-thirds as great as the over-all averages. Investigation of the influence of azo dyes (artificial butter color) showed that it was impossible to separate them from the carotenols by solvent extraction. The presence of these azo dyes does not interfere seriously with the antimony trichloride reaction, which is preferred, therefore, for butters containing such dyes.

Determination of vitamin A and carotenoids in butterfat: Spectroscopic characteristics of butterfat fractions and problems involved in biological interpretations, F. P. Zscheile, R. L. Henry, J. W. White, Jr., H. A. Nash, C. L. Shrewsbury, and S. M. Hauge. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 3, pp. 190–193, illus. 3*).—Samples of butterfat produced under different dietary conditions (E. S. R., 91, p. 68) were studied by the direct spectroscopic method, details of which are reported in the above study. "Total carotenoids were estimated and ultraviolet measurements were made on the unsaponifiable fraction. Characteristic curves of the total carotenoids and of the carotene fraction from very light 'colorless' butters, yellow butters, and butters from

cows fed alfalfa-bromegrass and corn silages were compared with that of β-carotene. Corresponding curves of the unsaponifiable fraction in the ultraviolet region were compared with that of vitamin A. Effects of clarification, adsorption, acid extraction, and freezing upon the characteristic curves were studied, as well as various factors affecting the reliability of the experimental procedures. Twenty-four samples were assayed biologically and attempts made to correlate spectroscopic with biological values. No clear-cut relationship could be established. The feed of the cows has a great influence on the nature of the carotenoids present in the butterfat. More extensive purification of the vitamin A fraction is desirable for the successful application of direct spectrophotometry to the determination of vitamin A in butterfats."

A colorimetric determination of nicotinic acid, A. E. TEERI and S. R. SHIMER. (N. H. Expt. Sta.). (*Jour. Biol. Chem., 153 (1944), No. 1, pp. 307–311*). —The authors note that most chemical methods for the determination of nicotinic acid involve reaction with cyanogen bromide and a primary or secondary aromatic amine. The difficulties most frequently met in the various methods are the necessity of waiting a certain length of time for development of the color, instability of the color, low color intensity, and failure adequately to account for the blank when turbid or colored extracts are being analyzed. These difficulties have been eliminated in a method in which *m*-phenylenediamine is used as the aromatic amine and hydrochloric acid is added to stabilize the color. Acidification with hydrochloric acid stabilizes the maximum color developed by the reaction of nicotinic acid with cyanogen bromide and *m*-phenylenediamine. Color development is immediate and complete within about 5 sec., and the intensity is greater than that obtained with many other amines.

To 10 cc. of a solution containing between 0γ and 60γ of nicotinic acid are added 5 cc. of the buffer solution (pH 6.6) and 5 cc. of the cyanogen bromide (4 percent) solution. After the mixture is allowed to stand at room temperature for 20 min., 1 cc. of the *m*-phenylenediamine solution (a 5-percent aqueous solution of *m*-phenylenediamine dihydrochloride, prepared freshly each week) is added, followed immediately by 1 cc. of 20 percent hydrochloric acid. Readings are made in a photoelectric colorimeter at 400 μ. The readings may be made immediately or at any time during the following 15 min. In the preparation of a standard curve, the solution containing no nicotinic acid is used to set the zero point of the instrument, thus making scale readings directly proportional to the concentration of nicotinic acid. *K*, the factor for converting optical density to concentration of nicotinic acid, should be determined each time analyses are carried out.

Exact determinations require the measurement of two blanks, the effects of which are additive. One of these is termed the sample blank and consists of 10 cc. of the extract being assayed, 5 cc. of buffer solution, 6 cc. of water, and 1 cc. of 20 percent hydrochloric acid. A distinct advantage of the acidification enters at this stage of the procedure, since any protein in the extract which is precipitated by the alcohol of the buffer is immediately redissolved upon addition of hydrochloric acid, thus providing a clear yellow solution. This, of course, applies to the sample being assayed as well as to the sample blank. The second, or reagent, blank consists of 16 cc. of water, 5 cc. of cyanogen bromide solution, and 1 cc. of the 5-percent *m*-phenylenediamine solution. This latter blank is constant and need be determined only once for a series of assays.

Yeast microbiological methods for determination of vitamins: Pantothenic acid, L. ATKIN, W. L. WILLIAMS, A. S. SCHULTZ, and C. N. FREY (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 1, pp. 67–71, illus. 2*).—The method, described in detail with regard to apparatus, solutions, yeast inoculum, preparation of samples for assay, and procedure, is a modification of the yeast-growth method

described by Atkin et al. (E. S. R., 90, p. 9) for the determination of pyridoxine. Fleischmann culture 4228, a strain of *Saccharomyces carlsbergensis,* is used as the test organism. The basal medium contains ammonium sulfate as a source of nitrogen and a relatively large proportion of asparagine. The latter compound in sufficient amount in the yeast-growth medium reduces to an insignificant level the interfering effect of β-alanine which, under certain conditions, can replace pantothenic acid as a yeast-growth factor. The yeast is grown in test tubes which are shaken at 30° C. for 16 hr., and the yeast growth is estimated by turbidimetric measurements made directly on the tubes with the photoelectric colorimeter. Extracts of substances to be assayed are prepared by aqueous extraction under pressure (15 lb. for 15 min.) at pH 5.6–5.7, by enzyme digestion at the same pH, or by enzyme digestion followed by aqueous extraction (15 lb. for 15 min.). The choice of extraction method depends upon the substance, since pantothenate occurs in bound form in some substances but not in others. An average recovery of 103.6 percent was obtained in several tests in which pantothenate was added to wheat, yeast extract, and dried yeast at the beginning of extraction. The results of assays of a number of representative substances (cereals, citrus fruits, meats, milk, urine, vegetables, and yeast) are presented. The values obtained compared favorably with results by other workers using other methods.

The determination of thiamin in blood, T. E. Friedemann and T. C. Kmieciak (*Jour. Lab. and Clin. Med., 28 (1943), No. 10, pp. 1262–1268*).—The method described in detail as to reagents and procedure is applied to whole oxalated blood which is adjusted to pH 4.5–5.5 and incubated with phosphatase in order to free thiamine from the cocarboxylase. Proteins are precipitated with metaphosphoric acid and removed by centrifugation. Thiamine in the supernatant solution is removed by adsorption on a specially prepared zeolite column from which the vitamin is readily eluted with a cold acidified 25 percent NaCl solution. Thiamine in the eluate is oxidized to thiochrome with alkaline $K_3Fe(CN)_6$, extracted with isobutyl alcohol and determined fluorometrically against a quinine sulfate standard. After correction for the fluorescence of the blank which is carried through the procedure, the thiamine content of the blood is obtained from a calibration curve representing the increase of fluorescence after the addition of 0.2, 0.4, 0.6, 0.8, or 1.0 μg of thiamine to blood samples which have been analyzed by the procedure. The blood of 36 human subjects in apparent good health and receiving an adequate diet contained from 3.0 to 11.2, with an average of 5.7 μg of thiamine per 100 cc.

Fruit jellies.—XII, Effect of methyl ester content of pectinates upon gel characteristics at different concentrations of sugar, G. L. Baker and M. W. Goodwin (*Delaware Sta. Bul. 246 (1944), pp. 33+, illus. 5*).—From an extensive further group of experiments of this series (E. S. R., 87, p. 17), numerous conclusions were drawn, including the following: The concentration of pectin necessary to make gels of standard strength at low-solids levels was found dependent upon the methoxyl content of the pectin. If pectins were compared on the same grade basis, between 7- and 4.5-percent methoxyl content, as the methoxyl content of pectins of similar manufacture was reduced the concentration of pectin necessary for standard-strength gel at any sugar-solids level was decreased. For acid-demethylated pectins, the minimum pectic requirement was found at about 4.5 percent CH_3O. At this level, no more pectin was required for a nonsugar gel than for one containing 65 percent soluble solids. As the soluble solids were reduced, more calcium was required to produce an optimum-type gel of standard strength; in gels from pectins of low methoxyl content (7–4.5 percent), the optimum pH for gelation tended to be higher; and the time of set increased. While the temperature of setting at any solids level tended to decrease and then increase as the methoxyl content decreased, reduction in the solids content lowered the setting temperature

of a gel. Turbidity of a gel increased with decrease in sugar solids, largely because of the necessary increase in pectin content. The increase in calcium needed for the larger amount of pectin also adversely affected turbidity. Syneresis in low-solids gels increased as the concentration of soluble solids decreased. A reduction in the calcium content and the addition of more pectin to maintain a standard gel strength aided in reducing syneresis. Melting temperatures of gels decreased at all methoxyl levels as the soluble solids were lowered. A decrease in calcium concentration or an increase in H-ion concentration lowered the melting temperatures. At corresponding methyl ester levels, acid-demethylated pectins, regardless of method of manufacture, required similar conditions for optimum gelation and showed more or less uniform jellying characteristics. While minimum pectic requirements on the same grade basis for all sugar concentrations were found below 7.5-percent methoxyl content, depolymerization was extensive and probably responsible for undesirable gel characteristics which appeared at this methoxyl level. A salt such as potassium or sodium citrate tended to improve gel characteristics, however. Depolymerization was found closely associated with demethylation. It must be carefully avoided if jelly value is to be retained.

The preservation of citrus juices with sulphurous acid, A. W. E. Downer (*Jour. Soc. Chem. Indus., Trans. and Commun., 62 (1943), No. 8, pp. 124–127, illus. 1*).—"Sulfited concentrated citrus juices contain a lower proportion of free sulfurous acid than unconcentrated juices, due to the proportionally higher concentration of sulfurous acid-fixing substances, presumably chiefly glucose, in the concentrates. Factors affecting the free sulfurous acid content of juices and glucose solutions were investigated. Fermentation appears to be more frequent among concentrated juices than among unconcentrated juices. As it appears that only free sulfurous acid exerts a preserving effect, it is suggested that the lower free sulfurous acid contents of concentrated juices contribute largely to the higher incidence of fermentation among them. Fermentation would probably be less frequent if concentrated juices contained more sulfurous acid."

AGRICULTURAL METEOROLGY

Meteorology—theoretical and applied, E. W. Hewson and R. W. Longley (*New York: John Wiley & Sons; London: Chapman & Hall, 1944, pp. 468+, illus. 195*).—In this textbook the authors endeavor to present an introductory treatment of basic meteorological theory and to offer a closer integration of forecasting technic with the theory on which it is founded.

Forecast rules (*Kansas City, Mo.: Weather Bureau Airport Station, [1944], pp. 29+, illus. 20*).

[Meteorological work] (*Florida Sta. Rpt. 1943, pp. 120–122, 123–124, 147, 148*).—Information is presented on the Federal-State Horticultural Protection Service, including the scope of the temperature forecasts, the character of the 1942–43 season, the accuracy of the forecasts with accompanying tabulated data, and the affiliated research. Meteorological records are also discussed and tabulated for the Everglades and North Florida Stations.

Thunder-storms and runoff at high elevations in northwestern New Mexico, L. L. Harrold (*Amer. Geophys. Union Trans., 24 (1944), pt. 2, pp. 425–438, illus. 20*).—The statements presented are "based on data collected and prepared for publication in the Hydrologic Bulletin series of the U. S. Department of Agriculture by A. J. Dickson at the Navajo Experiment Station"; they are illustrated by 11 maps and 9 sets of curves. A discussion by G. N. Brancato (p. 438) is included.

Classes and patterns of rainfall with reference to surface-runoff, L. Schiff (*Amer. Geophys. Union Trans., 24 (1944), pt. 2, pp. 438–451, illus. 6*).—The author

deals primarily with rainfall characteristics, consideration being given to the relationship of rainfall with infiltration and surface runoff on small watersheds. Excess, or supply of rainfall for surface runoff, depends on the duration and order in which rates of rainfall occur and conditions of watershed, and is mainly the difference between the rainfall and infiltration rates. The data used for setting up the five classes of rainfall, based on magnitude of intensities (classes) and sequence of occurrence of rainfall intensities (patterns), cover the 6-yr. period of record at the North Appalachian Watershed at Coshocton, Ohio. It is believed that use of such a classification as presented will prove helpful in the development of the relationship of classes and patterns of storms to hydrology and infiltration technic, and to the application of hydrologic data to some localities within a given hydrologic region, particularly where detailed rainfall data do not exist, for determining the relative frequency of classes and patterns of storms, the pattern of rainfall during the seasons, and the approximate variation in intensities for different classes of storms. A standard method of classifying rainfall throughout the country should prove of aid to a common understanding of one of the major factors in hydrology.

The relation of raindrop-size to intensity, J. O. Laws and D. A. Parsons. (U. S. D. A.). (*Amer. Geophys. Union Trans., 24 (1944), pt. 2, pp. 452–460, illus. 3*).—"Curiosity concerning the drop-size composition of natural rain has arisen from attempts to measure erodibility and infiltration capacity by sprinkling small areas of land with artificial rain. The results have been found to be affected by the drop size and velocity of the artificial rains applied, and the applicability of such results to conditions of natural rainfall has been thrown in doubt." It is hoped that the drop-size measurements here presented will prove useful in evaluating simulated-rain tests and in interpreting phenomena of erosion generally. The literature of the subject is briefly reviewed (10 references).

A 27-day period in Washington precipitation, G. G. Abbot (*Smithsn. Misc. Collect., 104 (1944), No. 3, pp. 4+, illus. 1*).—On March 17, 1943, the author predicted on the basis of data accumulated since 1924 the dates in 1943 when (prevailingly) precipitation was to be anticipated; this prediction was verified by the event. From the figures given it is seen that in 1943 the observed precipitation at Washington agreed well on the whole with the average march of 27-day cycles which had occurred in 108 cycles in other years of intermediate precipitation (1924–41). It thus seems probable that the 27-day cycle followed there so consistently without change of phase for at least 20 yr. will be so firmly fixed that it will be followed also for many years thereafter. This phenomenon parallels the solar constant of radiation, which displays variations in correlation with the period of 27 days (the effective resultant of the rotation periods of the sun). It is deemed surprising that in a purely gaseous body like the sun there should be fixed longitudinal distributions of the conditions which affect terrestrial precipitation. The significance and possible mechanism of the relationship are discussed briefly.

Evaporation-maps of the United States, R. E. Horton (*Amer. Geophys. Union Trans., 24 (1944), pt. 2, pp. 743–753, illus. 4*).

Wind-gradient observations, C. W. Thornthwaite and P. Kaser. (U. S. D. A.). (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 166–182, illus. 8*).—During the past year considerable effort was devoted toward obtaining an accurate series of wind-gradient observations that would reveal the law of wind structure. Several hundred anemometers were checked against a carefully calibrated instrument and a number were selected that were practically identical in starting, stopping, and running speeds, and that would commence running at wind velocities well under 1 mile per hour. A photographic recorder designed and built for recording wind velocities at 14 different positions was used in these studies, as well as a number of anemometers rebuilt to permit the measuring of still lower velocities—about 0.3 mile

per hour representing the minimum. For over a year, wind-gradient records were made with this equipment at New Philadelphia, Ohio; despite the deficiencies encountered, this is believed to be the first series of wind observations ever made that shows clearly the effect of atmospheric stability on the wind profile itself and thus to justify the publication here of a fairly extensive sample. The observations for 31 selected days (March 18, 1942-March 27, 1943) are given in tabular form, some of them are presented graphically, and the findings in general are discussed.

Freeze-and-thaw frequencies in the United States, R. J. Russell. (La. State Univ.). (*Amer. Geophys. Union Trans., 24 (1943), pt. 1, pp. 125–133, illus. 1*). The accompanying map shows the distribution of effective freeze-and-thaw alternations per year over the United States; it is based on observations of maximum and minimum temperature made by cooperating observers of the U. S. Weather Bureau at 863 stations (1914–31), representing a total of almost 10 million individual thermometer readings. This map is presented primarily as a statement of the distribution of a single factor that must be considered when climatological problems confront the agriculturist and others concerned with temperature changes. The accompanying discussion considers the effective freeze and thaw, basic data concerned, cartographic representation, and the effects of elevation, the Great Lakes, and latitude.

SOILS—FERTILIZERS

The soil survey in a unified regional program of development, J. C. McAmis (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 431–433*).—The author discusses use of soil survey information in the agricultural phases of the program of the Tennessee Valley Authority.

Report of committee on exchange of soil pictures and soil profiles, R. W. Simonson, M. E. Austin, R. F. Chandler, Jr., W. M. Johnson, and W. L. Powers (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 496–498, illus. 3*).—Questions of the preparation of a profile for photography, of equipment, of lighting and exposure, and of ways of displaying the photographs or slides are considered briefly, together with some of the common faults of pictures and common difficulties in taking them.

The soil profile as a natural reservoir, C. R. Hursh and P. W. Fletcher. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 480–486, illus. 5*).—It is concluded that an analogy of the storage functions of the soil profile to storage in artificial reservoirs is entirely justifiable. Use of such an analogy is advantageous in evaluating land-use effects upon stream behavior in terms of area inches of storage and runoff. These values may be expressed in terms comparable to storage and runoff values from artificial structures called for in water resources conservation planning.

The types of reservoir functions of the soil profile here recognized are: Permanent retention storage resulting in a complete loss to runoff, exemplified by the water that becomes soil moisture, measurable in terms of capillary pore space and defined as water of specific retention; ground water detention storage, resulting in an equalizing effect upon stream flow during nonstorm periods and providing the normal ground water aquifer of the soil, which may be measured in terms of noncapillary porosity; and storm water detention storage analogous to water held back temporarily during storm periods by detention-basin type structures, a type of storage represented by the moving gravitational water which reaches the stream in time to contribute to the storm hydrograph, and may or may not proceed to the normal water table before being transmitted to the stream.

The quantitative evaluation of soil formation and development by heavy mineral studies: A Grundy silt loam profile, C. E. Marshall and J. F. Hase-

MAN. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 448–453, illus. 1*).—The conditions which must be fulfilled in order to use resistant heavy minerals as indicators of soil formation and development are set forth, and a convenient method of calculation is suggested. In applying this method to a Grundy silt loam profile, the zircon was chosen as the primary indicator of gains and losses. It was found that the present-day profile was heavier than the original parent material, the increase being due partly to organic matter and partly to oxidation and hydration of minerals leading to clay formation. A quantitative measure of the clay formed was obtained together with indications concerning its movement. The coarsest sand present in quantity (0.125–0.046 mm.) was apparently quite immobile and unaffected by weathering. It could, therefore, be used instead of the zircon as an indicator of losses and gains. It is emphasized that profiles examined by this method must be taken to a sufficient depth, otherwise completely erroneous conclusions may be drawn. A study of the total heavy minerals revealed that mineral breakdown was vigorous in the 0–22 in. layers, that it fell off with increasing depth down to 40 in., and that it was negligible at greater depths.

Genesis of three soils developed from materials residual from limestone, C. G. MORGAN and S. S. OBENSHAIN. (Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 441–447, illus. 6*).—Soils formerly classified together as Hagerstown, having been differentiated recently into two series, the authors made an attempt to find the significant properties which are responsible for the agricultural differences between the two soils and the influence of the parent rocks which furnished their materials. Total analyses of samples from each horizon of the soils and their underlying rocks were made. For comparison, a similar study was made of a profile sample of Clarksville cherty silt loam, considered to have the least agricultural value of the soils developed over limestone in the same area. The resulting data are discussed in some detail.

The time required for Podzol profile formation as evidenced by the Mendenhall glacial deposits near Juneau, Alaska, R. F. CHANDLER, JR. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 454–459, illus. 4*).—The process of soil formation was studied in the glacial deposits left by the receding Mendenhall Glacier near Juneau, Alaska. Profile samples were obtained from soils 15, 90, 250, and approximately 1,000 yr. old. The following conclusions appeared to be warranted: Silt and clay formation appeared to have increased with time at all depths. The average silt plus clay values for the 0- to 2-in. and the 2- to 8-in. depths at the different ages is as follows: 15 yr., 12.4; 90 yr., 14.4; 250 yr., 11.6 (outwash); and approximately 1,000 yr., 26.3. The organic matter content increased with time and showed the following total accumulations, expressed as pounds per acre: 15 yr., 15,959; 90 yr., 89,480; 250 yr., 455,704; and 1,000 ± yr., 874,143. The exchangeable bases remained low in all profiles, but the exchange capacity increased greatly; hence, the percentage base saturation decreased markedly with time. The pH of the 0- to 2-in. depth had the values: 15 yr., 5.37; 90 yr., 5.05; 250 yr., 4.32; and 1,000 ± yr., 3.67.

Podzol profile formation was found slight at the end of a 250-yr. period. There are certainly required at least 500 yr., and more likely 1,000 yr. or more, for the establishment of an equilibrium condition between environment and soil profile.

Silica hardpan development in the Red and Yellow Podzolic soil region, E. WINTERS. (Univ. Tenn.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 437–440*).—Many soils in Tennessee and adjacent areas have a hardpan layer which restricts root and water penetration. These silica hardpans are particularly abundant in portions of the Coastal Plain and Interior Low Plateau provinces in Tennessee but are rare in the Great Valley section of the Valley and Ridge prov-

ince. They occur in soils developed under conditions of smooth to moderate topography, imperfect to slow drainage, silty textured parent material, a moderate to long time for development. They exhibit the following properties: Color, mottled brownish-yellow to gray; texture, fine sandy loam to silt loam; depth, 18–24 in. from the surface; thickness, 6 in .to several feet; structure, massive; consistence, brittle; reaction, acid.

It is suggested that cementation resulted from the precipitation and dehydration, during drought periods, of soluble SiO_2 resulting from silicate hydrolysis.

The hardpan soils of the Ozark region, H. H. KRUSEKOPF. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 434–436*).—The hardpan horizon here discussed is found below the solum and immediately above the C or parent material stratum. It is an extremely hard, cementlike, structureless mass. When dry, it is brittle and porous. The hardness increases with depth and is at its maximum at the top of the chert zone. The soil material when crushed is a harsh, siltlike powder. The included chert fragments vary in size from ¼ to 3 or 4 in. in diameter. All are highly weathered and have a rough and coated surface. The thickness of the hardpan varies from 4 to 12 in. and has its greatest development on the level areas. Iron concretions and accumulations are absent from the hardpan and from the gray layer above. Both the hardpan and the gray layer are acid, the pH being consistently between 4.65 and 4.90. The hardpans of this type are found in the Lebanon series, comprising soils which have a well-developed profile with sharply defined horizons of highly siliceous material containing chert rock fragments either throughout or in the soil and substratum.

The formation of the hardpan in the Ozark soils is attributed to the character of the parent rocks and their decomposition under certain topographic conditions. During geologic time the limestone has weathered to a depth of many feet and the residue of chert and clay now forms the parent material from which the soils have developed. Chert constitutes from 25 to 75 percent of the weathered material. Even the clay is highly siliceous in composition. The hardpan occurs immediately at the top of the undecomposed chert horizon. The weathering of the chert is both by disintegration and decomposition and results in the formation of silica powder and of free silica as sols and colloids. It is this amorphous material that has become indurated. New material is continually added by the weathering of the chert, so that the greatest induration is in the zone of most active chert decomposition. The lower part of the hardpan therefore is cemented to a harder mass than the upper part. The free silica, acting as the cementing agent, is thus formed in situ and has not been brought in from the upper horizons by illuviation. It is thoroughly commingled with the silica powder and tends to coagulate rapidly. Its extreme induration is attributed to the drying that frequently occurs in late summer. The highly weathered chert is firmly cemented with the silty soil material. Below the hardpan, where weathering is relatively slight, induration of the soil disappears and the chert fragments are larger and have hard, smooth surfaces.

Physical characteristics of soils.—VIII, State of aggregation, A. N. PURI and B. RAI (*Soil Sci., 57 (1944), No. 5, pp. 391–396, illus. 8*).—In the currently reported phase of this series of experiments on soil physical characteristics (E. S. R., 83, p. 306), the authors dispersed a laterite, a black cotton soil, and a typical Punjab alluvium repeatedly, by the method of 24-hr. shaking with coarse sand, a procedure of which one of the principal advantages noted is that the dispersed soil on drying, unlike a sodium soil, will not redisperse in water; and its mechanical analysis reveals the state of aggregation exactly as this exists in the dry soil. By this method, it was determined that soil can be dispersed and dried repeatedly without effect on its crumb structure in the dry state. Water-stable crumbs in a natural soil were found to represent more or less permanent structures which are depend-

ent on the ultimate mechanical composition of the soil and thus represent fundamental characteristics which are not likely to change from day to day. Mechanical analysis of natural soils without any preliminary treatment, chemical or mechanical, is held likely to prove of value, in the light of this investigation .

Effect of different types of organic materials and lime on soil aggregation, G. M. Browning and F. M. Milam. (U. S. D. A. and W. Va. Expt. Sta.). (*Soil Sci., 57 (1944), No. 2, pp. 91–106, illus. 12*).—Single applications, with lime, of organic materials that decompose rapidly, increased aggregation within a few days after they were incorporated with the soil, had their maximum effect in about 20–30 days, and then gradually lost their effectiveness. Materials slower to decompose required a longer time to exert their binding effect, but continued to be effective over a longer period. Relatively inert materials had little effect upon aggregation. Lime added with the organic materials significantly decreased aggregation in the subsurface samples of the Gilpin and Holston soils and in the Holston surface soil. In the Gilpin surface soil, lime significantly increased aggregation when added with buckwheat, rye, broomsedge, oat straw, soybeans, or corn stover; decreased aggregation with peat moss; and did not cause a significant change in the other organic materials studied. Aggregates formed in a short time from a single application of organic material were relatively stable under the conditions of this study. The relation of aggregate distribution to the dispersion ratio varies with different soils and with the type of organic material. Correlation coefficients between different grouping of aggregates and the dispersion ratio are shown.

The percolation rate of laboratory-packed samples appeared to be affected both by the mechanical loosening of the soil and the aggregating effect of the organic material. In general, lime decreased the percolation rate. The organic colloidal material was more highly dispersed in the presence of lime. In general, the addition of organic material to these soils improved some of the physical characteristics which affect the susceptibility of a soil to erosion.

Some aspects of the soil catena concept, T. M. Bushnell. (Purdue Univ.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 466–476, illus. 23*).—This is a discussion, largely of definitive purpose, both of taxonomic terminology and of that of the practical soil survey. Among other recommendations as to terminology it is suggested that the geographic element can be separated from the taxonomic element by calling the practical grouping which is a unit of mapping convenience a "catenary complex" rather than a catena. Such a geographic unit does not ordinarily include all the various possible topographic-denudational-hydrologic situations on a given parent material. The components of such a sequence are different soil series. In sharp contrast, the components of the catenary complex are soil types representing only part of the series belonging to a given taxonomic catena. The author is mainly concerned with the various possible forms of the taxonomic catena.

Laboratory percolation through undisturbed soil samples in relation to pore-size distribution, R. M. Smith, D. R. Browning, and G. G. Pohlman. (U. S. D. A. and W. Va. Expt. Sta.). (*Soil Sci., 57 (1944), No. 3, pp. 197–213, illus. 8*).—The formula previously noted (E. S. R., 91, p. 513) should read as follows:

$$+\frac{\text{percent pores drained between 10 and 40 cm.}}{4}$$

$$+\frac{\text{percent pores drained between 40 and 100 cm.}}{10}.$$

Variations in the Butler soil series in Nebraska, H. W. Smith and H. F. Rhoades. (Nebr. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 460–465,*

illus. 2).—Butler soils can be separated from those of the Crete and Fillmore series by the characteristics of the A and upper B horizons. Butler profiles have an incipient A_2 horizon which in the field is sometimes described as a zone of "gray sprinklings." This horizon, as compared with the A_1, is slightly lighter in color, has a phylliform rather than a granular structure, and has slightly less clay. It can be delineated by these characteristics under most moisture conditions. The incipient A_2 of the Butler profiles is indicated in the laboratory by a slight but abrupt decrease in content of 2μ clay and by a moderate and abrupt decrease in oxidizable material, both being in comparison with percentages in the A_1. In the B_{21} (upper claypan) the clay percentage increases markedly, but the content of oxidizable material continues to decrease gradually. These trends are reflected in the exchange capacity, plasticity index, hygroscopic coefficient, and moisture equivalent.

Fillmore profiles have an A_2 horizon, commonly known as a "gray layer" in the field. This horizon is lighter in color than the A_1, has a platy rather than a granular structure, and contains much less clay. It can be delineated under all moisture conditions.

Crete profiles do not have an A_2 horizon. The subsoil might be called claypan-like rather than a claypan, since the A_2 is lacking and an A_3 or a B_1 horizon is commonly present.

Profiles which have the morphology described for Butler soils have been observed under the following topographic conditions in Nebraska: Shallow depressions and the better-drained portions of deeper depressions in the Chernozen region of south-central Nebraska; those portions of flat loessial uplands, in the Prairie region of southeastern Nebraska, which either are microdepressions now or could have been in the past; flat uplands with a slope of 1 or 2 percent on loessial caps over drift within the Prairie region of southeastern Nebraska. Some areas which have been mapped as Butler but have soils with the characteristics of the Crete series include many of the flat loessial uplands, with a slope up to, and occasionally beyond, 5 percent in the Prairie region of southeastern Nebraska.

A lysimeter study of the nitrogen balance in irrigated soils, H. V. Smith (*Arizona Sta. Tech. Bul. 102 (1944), pp. 259–308+, illus. 19*).—The nitrogen balance for Gila clay loam and Mohave clay is given for two 6-yr. rotations, which included 3 yr. of alfalfa, one crop of cotton, two crops of wheat, and one crop of hegari. The Gila clay loam lost nitrogen, while under the same conditions of environment and cropping Mohave clay gained appreciable amounts of this element. All soils had a positive nitrogen balance when the nitrogen in the crops removed was credited to their respective tanks. A tank of Mohave clay which had been double cropped to hegari and wheat for 12 yr. also gained relatively large amounts of nitrogen. Greater amounts of nitrogen were gained, however, when alfalfa was included in the rotation. The nitrogen gains in the Mohave soil are attribued to the presence of an abundance of *Azotobacter* in the soil.

The nitrogen percentage of the Mohave clay increased, while in the Gila clay loam it decreased. At the present time, each contains 0.076 percent nitrogen, which is probably the equilibrium level for the local environment. At present, the crops on the Gila soil average only slightly better than those grown on the Mohave, showing a remarkable improvement in the crop-producing power of the Mohave soil since the original trial crop of wheat was grown in 1930. A possible explanation may be the more desirable conditions for growth in the Gila soil because of the presence of more humus.

The weight of both cotton stalks and seeds has been influenced by the amount of irrigation water applied. There has been a slight decline in the amount of nitrogen removed annually from the soils during the period 1931–42.

Wheat gives inferior yields following hegari, but the yields of wheat in the alfalfa rotation are superior to those in the hegari-wheat rotation. Alfalfa contributes definitely to the nitrogen content of the soil, although its use was not sufficient to maintain the original content of nitrogen in the Gila soil.

Normal seasonal changes of oxygen and carbon dioxide percentages in gas from the larger pores of three orchard subsoils, D. BOYNTON and O. C. COMPTON. (Cornell Univ.). (*Soil Sci., 57 (1944), No. 2, pp. 107–117, illus. 2*).—The measurements reported upon were made at two permanent gas-sampling stations located 3 ft. from the trunks of bearing McIntosh apple trees growing on each of three soil variations in the Cornell University orchard, Ithaca, N. Y. The soils are a sandy loam, a light silty clay loam, and a silty clay. The results indicated, in part, that under the weather conditions in the northeastern United States, oxygen percentage in gas from heavy subsoils is normally low in the early spring and increases as the season advances. Under these conditions the minimum oxygen level and the extent of the period of low oxygen pressure were shown apparently to be determined by accumulated precipitation, by soil texture and compaction, and by depth. Carbon dioxide percentage fluctuated within a range narrower than that of oxygen, and usually reached maximum levels during the summer months when soil temperature was relatively high, even though oxygen percentage may be relatively high at the same time.

The importance of oxygen in the nutrient substrate for plants: Ion absorption, L. P. PEPKOWITZ and J. W. SHIVE. (N. J. Expt. Stas.). (*Soil Sci., 57 (1944), No. 2 pp. 143–154, illus. 4*).—Culture apparatus and an experimental method for the direct determination of ion absorption by plants at approximately maintained dissolved oxygen tensions in the substrate by periodic analysis of the nutrient solution without disturbance of the plants are described. The tomato and the soybean were used as the indicator plants, and the daily absorption of potassium, calcium, and phosphorus was determined over weekly experimental intervals at oxygen levels of 0, 4, 8, and 16 p. p. m.

The absorption of all the nutrient ions considered was directly related to the oxygen tension of the substrate. The absorption of the nutrient ions was least at 0 p. p. m. and rose to an optimum at the higher oxygen levels. For soybeans, the maximum absorption rate was obtained at 16 p. p. m.; for tomatoes, at 8 p. p. m. In both these plants, 16 p. p. m. retarded the absorption rate to a point below the optimum. The absorption of calcium and phosphorus was directly dependent upon the dissolved oxygen supply. Potassium, however, was not so materially influenced by the oxygen levels of the substrate, but demonstrated an independence of the various oxygen levels greater than that of the calcium and phosphorus. The data indicated that the generally vigorous activity of the plants on clear, dry days accelerated the absorption of nutrient ions, especially calcium and phosphorus. These factors, however, have much less influence in modifying the rates of potassium absorption than of any of the other ions considered.

Soil-plant relationships and vertical zonation in the southern interior of British Columbia, R. H. SPILSBURY and E. W. TISDALE (*Sci. Agr., 24 (1944), No. 9, pp. 395–436, illus. 10*).—A close agreement exists between soil and plant zones within a limited geographical unit. To a liimted extent it was shown that the texture, depth, and reaction of soils within a zone may be identified by the composition and abundance of the plant cover. Similarly, much can be deduced from soil studies regarding the potential plant cover of areas on which the vegetation has been temporarily altered by factors such as grazing or fire. The data indicate that both plant communities and certain characteristic species are good indicators of the habitat.

The authors are enunciating no new theory in expressing the belief that soil and plant studies are complementary and, with experience, may be used to mutual advantage in gaining a fuller understanding of both these natural resources. Joint soil-plant surveys seem especially suitable for broad reconnaissance work where lack of detail in the mapping of soils and vegetation may be offset by better understanding of relationships between the various types. For range surveys, soil-plant studies are a means of describing zones, their capabilities and limitations for man's use in a most effective and practical manner. Where vertical zonation of vegetation and soils occurs, proper grazing utilization can be secured only by management practices based on the nature and relationship of the different zones. Neglect of this principle results in depletion of both vegetation and soil.

Types and distribution of microorganisms in some Florida soils, F. B. SMITH and O. E. GALL (*Florida Sta. Bul. 396 (1944), pp. 41+*).—Data are presented on numbers of molds, bacteria, and *Actinomyces* in the surface soil of Norfolk, Blanton, Hernando, Gainesville, Orlando, Leon, and Portsmouth fine sands at monthly intervals from June 1938 to June 1939, inclusive. A flora was found for the different soil types, in spite of the large interactions between soil type and temperature, rainfall, and moisture content of soils. Because of soil texture and drainage conditions, rainfall did not have as pronounced effect on numbers of organisms in these soils as is commonly the case with soils of heavier texture. The effect of temperature on numbers of organisms was most apparent in the case of the bacteria. There were larger average numbers of bacteria in the soil after the mean monthly temperatures dropped below 70° F. than when the mean temperature was above 70°. The effect of temperature on numbers of *Actinomyces* and molds was complicated by the time of application and types of organic matter used.

Numbers of molds were affected significantly in the Arredondo fine sand by the cropping system practiced. The average numbers of molds were lower in the soils cropped continuously to corn and peanuts than in the soils planted to corn and peanuts in alternate years with *Crotalaria* or continuous corn and peanuts with a summer cover crop of *Crotalaria.* The average numbers of molds and *Actinomyces* were larger in the Norfolk loamy fine sand cropped to corn and peanuts than in the "resting" soil, but the average numbers of bacteria were larger in the uncropped land than in the soil under cultivation. This result is undoubtedly explained by the small amount of residues available for plowing under, the type of residue, and the short duration of the experiment.

The detrimental effects of strong soil acidity on numbers of micro-organisms and, consequently, on all biological action in soils were clearly indicated in the results obtained in the Norfolk loamy fine sand that had been brought to different pH levels by treatment with sulfur and lime. The tolerance of molds for acidity, the sensitivity of bacteria and *Actinomyces* to acid soil conditions, and the acute need for organic matter in this soil were emphasized by the results obtained. The results obtained in the study on the algal flora of the soil were purely qualitative in nature, but a scientific approach has been made and the basis laid for a systematic study of the role of these organisms in soil fertility.

The synthesis of lignin-like complexes by fungi, L. A. PINCK and F. E. ALLISON. (U. S. D. A.). (*Soil Sci., 57 (1944), No. 2, pp. 155–161*).—The authors report upon synthesis of ligninlike complexes by 12 cultures of filamentous fungi grown on a mineral-sucrose medium; the mycelium of *Cladosporium* was found to contain as high as 24 percent of these ligninlike substances. The average values for the genera studied were *Cladosporium* 21.1 percent, *Helminthosporium* 19, *Humicola* 8.1, *Dematium* 7.1, *Alternaria* 6.8, *Aspergillus* 6.4, *Metarrhizium* 3.6, and *Gliocladium* 2.4 percent. These values represent the nonnitrogenous portion of

the fungal substance that resisted digestion with 72 percent sulfuric acid. In general, the black or brown fungi were comparatively high in lignin complexes, whereas the colorless or light-colored organisms contained lower percentages. The failure of previous workers, using various genera, to agree as to the ability of fungi to form substances that are resistant to decay is believed largely explained by these results. Under the best growth conditions (pH 7 or slightly above, and adequate trace elements present) approximately 40–50 percent of the carbon of the sucrose was converted into cell material by *Cladosporium, Helminthosporium,* and *Gliocladium.* The corresponding values for the other organisms were 25–30 percent. The C : N ratios of the fungus material varied between 10.7 and 22.4 percent, with an average value of 15.3.

It is pointed out that the high-lignin organisms grow mostly on decaying vegetation at or above the soil surface. A system such as that used in stubble mulch or trash mulch farming would therefore be expected to be favorable to a high yield of humus.

Microbiological studies of the effect of straw used as a mulch, T. M. McCalla. (U. S. D. A. coop. Nebr. Expt. Sta.). (*Kans. Acad. Sci. Trans., 46 (1943), pp. 52–56, illus. 2*).—The microbiological population of straw mulch was quite different from that found in soil farmed by conventional methods. The zone of most intense microbiological activity was found to be at the point of soil and residue contact. This was found to be especially true during periods of moist weather. There was continuous microbiological activity by the organisms to reduce the protective cover of the plant residues. Special consideration is given to the relation of subtillage practices to the rate of decomposition processes in the soil.

Soil fertility practices for cotton production: Heathman Field, J. Pitner (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 7, pp. 1, 8*).—The variation of fertility in Delta soils is pointed out, and the author suggests that this variation requires that several locations be investigated in developing fertilizer recommendations. In experiments investigating the use of nitrogen in addition to winter legumes, maximum yields of cotton were obtained following the crop of winter legumes on which 20 lb. of commercial nitrogen were used.

Where do we stand with fertilizers? F. S. Prince. (Univ. N. H.). (*Better Crops With Plant Food, 28 (1944), Nos. 1, pp. 6–12, 49–50, illus. 6; 2, pp. 13–16, 49*).—Effects of omitting and of doubling the nitrogen, phosphate, and postassium contents of fertilizers for potatoes and results of other experiments upon fertilizers for this crop and of fertilizer experiments on hay crops and pasture land are shown in tabular comparisons of yields and are discussed and illustrated.

From experiments carried on for 6 yr. at one point and for 12 yr. at another, a 4–8–7 fertilizer being used as standard of comparison, the New Hampshire potato yield was reduced by 17 bu. per acre on omitting the nitrogen and was increased by 12.5 bu. on doubling the nitrogen. Omitting and doubling the phosphate produced —68.5 and +32.5 bu. differences from the standard, respectively. Omitting and doubilng the potassium content of the fertilizer produced —102 and +26 bu.-per-acre departures from the standard, respectively. Similar data from Maine experiments are given.

For grass hay in New Hampshire, nitrogen has been shown to be the most important factor limiting high yields, but the response from nitrogen is reduced when there is a deficiency of phosphoric acid and potassium in the soil.

Top dressing with fertilizers of approximately 1 : 1 : 1 ratio produced the most striking increases in the hay crop. For alfalfa and the clovers, potassium produced the outstanding single-element improvements in hay yield, but, again, a complete fertilizer gave greater gains.

The importance in New England, which does not have natural resources of the fertilizer elements, of emergency stock piles of these materials essential for full crop production is emphasized. "In the future, this is a factor which might well be considered in any scheme for national planning."

The relative availability to plants of exchangeable calcium from soil separates of sand, silt, and clay, R. KUNIN and W. R. ROBBINS. (N. J. Expt. Stas.). (*Soil Sci., 57 (1944), No. 2, pp. 137–142*).—Samples of sand, silt, and clay fractions mechanically separated from Montalto silt loam were selected to contain equal amounts of exchangeable calcium and were used with white quartz sand as a substrate for the growth of tomato plants, essential ions other than calcium being supplied in soluble form.

Plants grew almost equally well in cultures containing the sand-, the silt-, and the clay-separate fractions. Plants absorbed calcium held in exchangeable form by sand particles almost as rapidly as from silt and clay particles. Under the conditions of this experiment, the absorption of exchangeable calcium from the sand-separate particles apparently occurred largely by processes other than contact exchange. It was concluded that particles in the soil as large as those classed as sand cannot be neglected as an important source of available calcium for plants.

Some factors affecting chlorosis on high-lime soils.—I, Ferrous and ferric iron, D. W. THORNE and A. WALLACE. (Utah Expt. Sta.). (*Soil Sci., 57 (1944), No. 4, pp. 299–312*).—Soils from areas producing green plants contained significantly more iron and manganese readily reducible by 0.2-percent hydroquinone solution than did soils producing chlorotic plants. Ferrous and ferric iron salts added to soil of either class were quickly immobilized, only small quantities remaining reducible by 0.2 percent hydroquinone. Chlorotic leaves from peach, pear, grape, prune, and apple contained more potassium and nitrogen and less iron and calcium than did green leaves. The iron content of green leaves was significantly higher than that of chlorotic leaves when results were expressed on the basis of leaf area, but when expressed on a dry weight basis the mean difference was not significant. Similar relations were also found for the manganese and calcium content of leaves with respect to a method of expressing the results. No significant difference was found in the chemical composition of recent terminal branch growth from chlorotic and green trees. The iron content of fruit from peach and pear trees was appreciably greater for green than for chlorotic trees, and green leaves contained more iron soluble in N HCl than did chlorotic leaves. Hydrochloric, acetic and formic acid solutions each extracted appreciably more ferrous iron from green leaves than from chlorotic leaves. Extracts and sap from green leaves had a greater capacity to reduce ferric iron than did similarly obtained extracts and sap from chlorotic leaves.

The results obtained are held to indicate that soil and plant conditions associated with chlorosis are more conducive to the maintenance of iron in insoluble ferric compounds than are conditions in both soils and plants associated with normal green leaf development.

AGRICULTURAL BOTANY

An account of sixteenth-century agriculture on the Mexican Plateau, H. S. REED. (Univ. Calif.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 7, pp. 209–213*).—This account of various plants cultivated in ancient Tezcuco is based mainly on a memoir written in 1582.[1]

[1]Relacion de Tezcoco, J. B. Pomar. *In* Nueva Coleccion de Documentos para la Historia de Mexico, vol. 3, J. García Icazbalceta. México: Salvator Chavez Hayhoe, 1941, vol. 3, pp. 1–64.

Utilization of seaweeds, C. K. TSENG (*Sci. Mo., 59 (1944), No. 1, pp. 37–46, illus. 10*).—The author discusses the uses of seaweeds as foods, stock feed, fertilizer, drugs, chemicals, and gums including agar as employed in bacteriological culture media, as well as the seaweed industry in California and its future.

Elements of bacterial cytology, G. KNAYSI (*Ithaca, N. Y.: Comstock Pub. Co., 1944, pp. 209+, illus. 101*).—"The information given in this book has been collected by the author during the past 15 yr. both from his own experience and from a critical knowledge of the literature; it constitutes a part of a course he has developed to its present stage during the same period." The main subjects considered are the form and size of bacterial cells, the cytoplasm and nucleus, cell wall and slime layer, physicochemical properties of bacterial membranes, cell division, vacuoles and reserve material, the motion of bacteria, spores, staining, bacterial cultures, and the cytology of the actinomycetes, spirochetes, and myxobacteria. A subject index and over eight pages of bibliography are included.

The culture, general physiology, morphology, and classification of the nonsulfur purple and brown bacteria, C. B. VAN NIEL (*Bact. Rev., 8 (1944), No. 1, pp. 118, illus. 102*).—A monographic presentation, with 162 references.

A sieve device for sampling air-borne microorganisms, H. G. DUBUY and L. R. CRISP (*Pub. Health Rpts. [U. S.], 59 (1944), No. 25, pp. 829–832, illus. 3*).—The device consists of two parts, a box equipped with an air outlet and holding a standard petri dish with nutrient agar and a cover consisting of a brass plate with 300 openings each 0.796 mm. in diameter; the cover fits the box airtight and is fastened by means of two toggle clamps.

A manometric valve or respirator, A. CANTOR (*Science, 100 (1944), No. 2584, p. 16, illus. 1*).—The valve described and illustrated is said to permit of a fully automatic increase and decrease in pressure in reaction or culture vessels or rooms over a variable fixed range; it also obviates the discharge and consequent replacement of waste liquid from the valve. The equipment has been used to breathe cultures of micro-organisms grown upon and within porous masses, i. e., in the study of metabolizing masses which otherwise offer resistance to uniform aeration and temperature control.

Mechanical aids in the direct miscroscopic method of counting bacteria, C. OLSON, JR., and F. G. WARREN (*Jour. Bact., 47 (1944), No. 6, pp. 495–497, illus. 2*).

Observations on the electron microscopy of B[acillus] cereus and tyrothricin action, F. H. JOHNSON (*Jour. Bact., 47 (1944), No. 6, pp. 551–557, illus. 3*).

Microbial thermogenesis in the decomposition of plant materials.—III, Simplified equipment for routine studies, W. V. BARTHOLEMEW and A. G. NORMAN. (Iowa Expt. Sta.). (*Jour. Bact., 47 (1944), No. 6, pp. 499–504, illus. 4*).—Simple equipment for studying heat evolution by decomposing plant materials is described and illustrated. This apparatus is less expensive to construct than the fully adiabatic one previously used (E. S. R., 85, p. 600). Data from representative experiments are given to show the sensitivity of temperature control and consistency of results obtained.

Decomposition of guayule resins by microorganisms, P. J. ALLEN, J. NAGHSKI, and S. R. HOOVER. (U. S. D. A.). (*Jour. Bact., 47 (1944), No. 6, pp. 559–572, illus. 2*).—The occurrence of resin-decomposing organisms during retting by the natural microflora for production of improved guayule rubber was studied by detecting their ability to cause clearing of resin emulsions suspended in agar. Guayule resins are not appreciably bactericidal. The resin-decomposing organisms isolated included *Aspergillus fumigatus, Rhizopus arrhizus,* a dematiaceous fungus, *Actinomyces fradii, Micrococcus* sp., three isolates of the *Bacillus subtilis* group, an unidentified gram-negative rod, *Pseudomonas boreopolis,* and *Achromobacter lacticum.* All attacked some portion of the crude-rubber extract, but the unsaponi-

fiable fraction contained compounds attacked only by *Actinomyces fradii,* the dematiaceous fungus, and the gram-negative rod; only the last two attacked resin. The rate and extent of clearing of resin-agar emulsions by these organisms was correlated with the decomposition of resin in liquid culture, as shown by chemical analysis. The presence of nutrients did not prevent the production of resin-decomposing enzymes; on the contrary, by decreasing the amount of growth it led to more rapid and extensive resin clearing.

Bacteriostatic and fungistatic action of some organic chemicals, T. M. Eastwood. (Ind. Expt. Sta.). (*Science, 100 (1944), No. 2584, pp. 10–11*).—The results, briefly reported, indicate that use of various bacteriostatic and fungistatic organic chemicals offers a means of separating bacteria and fungi in the isolation of pathogenic organisms.

The bactericidal action of cabbage and other vegetable juices, C. S. Pederson and P. Fisher (*New York State Sta. Tech. Bul. 273 (1944), pp. 32, illus. 13*).—The undesirable gram-negative aerobic bacteria on the surface of cabbage leaves ordinarily disappear shortly after the cabbage is cut; this change in bacterial numbers was investigated in cabbage and other vegetables. Many of these bacteria were identified as species of *Achromobacter, Flavobacterium,* and *Pseudomonas.* The presence of a bactericidal factor in cabbage tissue was found to reduce markedly the number of gram-negative bacteria within 6–24 hr., but its activity against gram-positive bacteria was much less. It was greater in amount in some varieties of cabbage than in others and was inactivated by heating. Many other vegetables do not contain an appreciable amount. The bactericidal substance of onions differs from that of cabbage in that it is only partially inactivated by heating. The bactericidal activity of the juice of some cabbage varieties was as active, if not more so, than the juice of onions. The cabbage substance is active against *Escherichia coli* and, to some extent, *Staphylococcus aureus.*

Estimation of the anti-bacterial activity of fungi that are difficult to grow on liquid media, W. H. Wilkins and G. C. M. Harris (*Nature [London], 153 (1944), No. 3889, pp. 590–591, illus. 1*).The method presented consists essentially in putting a few drops of the liquid to be tested into a circular hole cut in the center of a plate of bulk-seeded agar medium, with subsequent production, after inoculation at 37° C., of a zone of bacterial inhibition the width of which varies in proportion to the concentration of the bacteriostatic substance. The method differs from somewhat similar ones of other workers only in that the standardized technic enables it to give a relatively quantitative estimation.

Strain specificity and production of antibiotic substances.—III, Pencillium notatum-chrysogenum group, S. A. Waksman and H. C. Reilly. (N. J. Expt. Stas.). (*Natl. Acad. Sci. Proc., 30 (1944), No. 5, pp. 99–105*).—In this further installment of the series (E. S. R., 90, p. 26), the production of penicillin is found not limited to any one species of fungi or even to the genus *Penicillium.* Different species and different strains of the same fungus appear to produce the maximum amount of penicillin or penicillinlike substances under different conditions of culture. Whereas some strains are most active under one set of conditions, others exert their greatest activity under different conditions. The fact that, in addition to penicillin, a second antibiotic factor is produced by most of the penicillin producers further complicates the relationship; this factor may be active only in the presence of glucose, as in *P. notatum* strains, or its activity may be independent of the glucose in the medium, as for the aspergillic acid produced by *Aspergillus flavus.* The production of the second factor is also influenced by the composition of the medium and by conditions of growth.

Production of gliotoxin by Aspergillus fumigatus mut. helvola Yuill, G. A. Glister and T. I. Williams (*Nature [London], 153 (1944), No. 3891, p. 651*).

Some methods for the study of moulds, A. Fleming and G. Smith (*Brit. Mycol. Soc. Trans., 27 (1944), pt. 1–2, pp. 13–19*).—Consideration is given to the preparation of museum specimens of mold fungi by cultures made on paper or cellophane disks and to cellophane culture as a method of examining germination of mold spores and of studying older cultures.

The organization of the study of systematic mycology, S. P. Wiltshire (*Brit. Mycol. Soc. Trans., 27 (1944), pt. 1–2, pp. 1–12*).—Presidential address.

Nomenclature of fungi, G. R. Bisby (*Mycologia, 36 (1944), No. 3, pp. 279–285*).—A review of some of the mycological nomenclature problems, with suggestions for a few possible interpretations, revisions, or additions to the rules which may prove useful for discussion, especially since the adoption in 1930 of the type method necessitates reconsideration of much past procedure.

Studies on film-forming yeasts: Acid production by Zygopichia and Zygohansenula, W. J. Nickerson (*Mycologia, 36 (1944), No. 3, pp. 224–233, illus. 4*).—The author endeavors to point out some of the characteristics of acid production, film formation, and nitrate utilization of a few species of film-forming yeasts; whether any of these have taxonomic value must be determined by studies of more isolates in all the genera concerned. From the evidence presented, however, it appears that though nitrate utilization may be the only criterion on which there is no overlap between *Pichia* and *Hansenula,* it is indicative of a fundamentl dissimilarity in the enzymic make-up of the two genera—the former more oxidative and the latter more reductive in nature. Though there are some species such as *P. fermentans* and *Zygopichia farinosa* which are able to cause fermentations, thus creating a resemblance to *Hansenula,* these should serve to emphasize that yeast genera are not clear-cut affairs without transitional forms.

Variants in fungi: Formation, reversion, and prevention, R. A. Steinberg. (U. S. D. A.). (*Science, 100 (1944), No. 2584, p. 10*).—A note on the effects of temperature and chemical treatments (e. g., HNO_3, amino acids), with special reference to *Aspergillus niger.*

Development of the perithecium in Aspergillus fischeri Wehmer, with a description of crozier formation, L. S. Olive (*Mycologia, 36 (1944), No. 3, pp. 266–275, illus. 45*).

An undescribed Corticium with conidia, C. L. Shear and R. W. Davidson. (U. S. D. A.). (*Mycologia, 36 (1944), No. 3, pp. 294–299, illus. 2*).—*C. conigenum* n. sp. from an oak stump is described.

The Tremellales of the north central United States and adjacent Canada, G. W. Martin (*Iowa Univ. Studies Nat. Hist., 18 (1944), No. 3, pp. 88, illus. 38*).—A taxonomic monograph of this fungus group of the Basidiomycetes, including new nomenclature and keys to the families, genera, and species.

The flowering plants and ferns of Mount Diablo, California, their distribution and association into plant communities, M. L. Bowerman (*Berkeley, Calif.: Gillick Press, 1944, pp. 290+, illus. 27*).

The woody plants of Maine, their occurrence and distribution: An annotated catalog of the woody spermatophytes, F. Hyland and F. H. Steinmetz (*Maine Univ. Studies, 2. ser., No. 59 (1944), pp. 72+, illus. 10*).—An annotated catalog of the woody plants of Maine, with an introductory section on The White Pine—A Symbol (p. V). An annotated bibliography and an index to the genera and the common names of the species are provided.

Trees of south Florida.—I, Five naturalized exotic forest trees. II, Five native cabinet woods, J. C. Gifford (*Sci. Mo., 59 (1944), Nos. 1, pp. 21–28, illus. 7; 2, pp. 101–107, illus. 6*).—Attention is called to 10 kinds of trees that could be profitably grown on many thousands of acres in Florida now idle. The 5 introduced species are the candlenut tree (*Aleurites moluccana*), sapodilla, the lebbek

tree (*Albizzia julibrissin*), *Casuarina* spp., and the cajeput (*Melaleuca leucodendron*). The 5 natives are *Lysiloma bahamensis,* mahogany (*Swietenia mahagoni*), the fish poison tree (*Piscidia communis*), false mastic (*Sideroxylon foetidissimum*), and lignumvitae (*Guaiacum sanctum*). The treatment of cabinet woods is briefly discussed.

Foundations of plant geography, S. A. Cain (*New York and London: Harper & Bros., 1944, pp. 556+, illus. 63*).—In this volume the author offers an inquiry into the foundations of the science of plant geography rather than a descriptive presentation of the subject. He has endeavored to survey the related fields of science for concepts and working methods useful in interpreting the phenomena of plant distribution. Many of these materials are from paleontology, taxonomy, evolution, genetics, and cytology; the author has sought to "cut the hedgerows" between these fields and to discover some of the significance which one has for another.

Contributions to the flora and phytogeography of south-western Greenland: An enumeration of the vascular plants, with critical notes, N. Polunin (*Jour. Linn. Soc. London, Bot., 52 (1943), No. 345, pp. 349–406*).

Revegetation of the abandoned fields of Mammoth Cave National Park, B. B. McInteer. (Univ. Ky.). (*Amer. Midland Nat., 31 (1944), No. 2, pp. 501–504*).—The fields under consideration in this ecological study each comprised an area of 5–20 acres; they are adjacent to or even partially surrounded by a compact growth of forest vegetation containing many species of native trees large enough to have been producing fruit during the period of the investigation.

Nitrogen fixation in leguminous plants, II, III (*Linn. Soc. N. S. Wales, Proc., 67 (1942), pt. 3–4, pp. 205–212; 68 (1943), pt. 1–2, pp. 1–8*).—The following installments of the series are included (E. S. R., 88, p. 176):

II. *Is symbiotic nitrogen fixation influenced by Azotobacter?* H. L. Jensen.—Alfalfa and white clover were grown in agar or sand cultures with or without inoculation with *A. chroococcum* in addition to root-nodule bacteria; in no case could significant stimulation of N fixation by *Azotobacter* be observed. Adding straw to the sand increased the numbers of *Azotobacter* greatly, but had a detrimental effect on alfalfa. The same was true with straw extract inoculated with pure cultures of *Azotobacter;* filtrates from such cultures inhibited the elongation of roots of young alfalfa seedlings. No harmful effect of straw was observed in the presence of combined N. In the alfalfa and clover rhizospheres in sand, the numbers of *Azotobacter* were only moderately increased in comparison with the sand medium itself. Intact roots of alfalfa did not appear to excrete organic substances supporting *Azotobacter* growth.

III. *The importance of molybdenum in symbiotic nitrogen fixation,* H. L. Jensen and R. C. Betty.—Nitrogen fixation by alfalfa and white clover in agar culture was not stimulated by additions of Mo in amounts exceeding 0.03γ–0.05γ per plant. As much as 37,000 parts of N could be fixed per part of Mo present. Alfalfa grown in sand showed a relatively small but significant response to Mo when the medium provided only 1 part of assimilable Mo per 80,000 parts of N fixed. At a Mo : N ratio of 1 : 20,000 further addition of Mo had no effect. Root nodules from leguminous plants grown in soil or sand of low Mo content were 5–15 times richer in Mo than the actual roots, which again were generally richer in Mo than the tops. Alfalfa plants took up more Mo when fixing free N than when utilizing combined forms. These results show that Mo stimulates the process of symbiotic N fixation, besides being presumably required for the general metabolism. Vanadium did not appear capable of replacing Mo.

Serological studies of the root-nodule bacteria.—III, Tests of neighbouring strains of the same species, D. Q. Hughes and J. M. Vincent (*Linn. Soc. N. S.*

Wales, Proc., 67 (1942), pt. 3–4, pp. 142–152).—Previous studies of the series have been on strains of *Rhizobium meliloti* and *R. trifolii,* respectively (E. S. R., 90, p. 28; 88, p. 741). Experiences of other workers, as well as their own results, have convinced the authors that the agglutination test is reliable and reflects some fundamental characteristic of the bacterial cell which is relatively constant. Good agreement was obtained with serums from different animals, after prolonged laboratory culture and after passage through a host plant. In the present study, 20 cultures of *R. meliloti* obtained from separate plants of *Medicago minima,* all growing within the same farm area, were found to contain at least 9 distinct serological groups. Furthermore, there was no evident relationship between location in the field and affinity in observed reaction. Similar tests with *R. trifolii,* both from *Trifolium glomeratum* and *T. repens,* showed at least 8 strains in 19 and 6 in 18 cultures, respectively. Twelve cultures of *R. meliloti* from a much smaller area showed 3 types, although 1 of these predominated. When cultures developed from pairs of nodules—each pair from the same plant—were compared, the members of the pair in 5 cases were definitely unlike, in 1 case a difference was probable, and the remainder were possibly alike. In contrast to this heterogeneity, replicate single-colony pickings from material developed from the same nodule gave consistently the same result. No case of difference within the nodule was found with cultures developed from 73 colonies representing in all 10 nodules from 4 plants, although it was known that this material showed differences between nodules.

Variation in the nitrogen-fixing property of Rhizobium trifolii, J. M. Vincent (*Nature [London], 153 (1944), No. 3886, pp. 496–497*).—Two cases are noted where a culture, from a single colony developed from a single nodule, has shown at the time of first testing on its host clover species the presence of definite "substrains" with distinctly different nitrogen-fixing ability but with the same serological reactions as the original cultures. These results and their significance are briefly discussed.

Polyethylene glycols as carriers for growth-regulating substances, J. W. Mitchell and C. L. Hamner. (U. S. D. A.). (*Bot. Gaz., 105 (1944), No. 4, pp. 474–483, illus. 6*).—Addition of Carbowax compounds to aqueous solutions of 2,4-dichlorophenoxyacetic acid increased the effectiveness of the acid in inducing growth responses and form changes in kidney bean plants as measured quantitatively. Marked form changes occurred in roots, hypocotyl, first internode, and terminal and lateral buds as a result of applying 4γ of the acid to one primary leaf of seedlings; applying 1γ resulted in greatly inhibited bud growth. A 0.5-percent solution of Carbowax 1500 proved nontoxic to several kinds of crop plants. Relatively high concentrations of 2,4-dichlorophenoxyacetic acid in solution with Carbowax killed the bean plants when applied either to the soil or to above-ground parts. The possibility of using this compound, and various others together with Carbowax, as selective serbicides is suggested. The relatively simple quantitative method of measuring the effectiveness of growth substances described is based on applying exact amounts of the substance to a bean leaf and subsequently measuring the growth changes in the stems and buds.

Growth stimulation by manganese sulphate, indole-3-acetic acid, and colchicine in pollen germination and pollen tube growth, T.-L. Loo and T.-C. Hwang (*Amer. Jour. Bot., 31 (1944), No. 6, pp. 356–367, illus. 4*).—Pollen germination and tube growth in *Antirrhinum majus* and many other plant species were markedly accelerated by $MnSO_4$ at concentrations of 10^{-4} to 10^{-10} M, but were normal. Colchicine in low concentration stimulated pollen growth as did $MnSO_4$, but in high concentration was not beneficial. Pollen tubes grown in colchicine media had rough membranes and grew into spirals or circles or developed a zigzag habit. Indole-3-acetic acid in low concentration was less effective than $MnSO_4$ or

colchicine in accelerating pollen germination and in promoting pollen tube growth; in high concentration it was definitely growth-inhibitory. Growth of pollen tubes in this medium was exceedingly abnormal. There are 33 references.

The effects of synthetic growth substances on the shoot apex of Tropaeolum majus L., E. BALL (*Amer. Jour. Bot., 31 (1944), No. 6, pp. 316–327, illus. 21*).—The densely cytoplasmic cells of this embryonic region underwent no hypertrophy when treated with 0.1-, 1-, 3-, and 6-percent concentrations of indoleacetic and indolepropionic acids in lanolin emulsion. This fundamental difference between the reactions of these meristematic tissues and those of mature parenchymatous cells may be interpreted as a kind of "immunity" of the tissues of the shoot apex toward growth substances. The shoot apex reacted only by structural changes and by an abnormal manner of production of foliar primordia; the former consisted in the formation of a one-layered tunica instead of the normal two- or three-layered one, and the latter in the production of foliar primordia out of their normal positions. The abnormal phyllotaxies never constituted any regular system other than the normal 3/8 arrangement; the changes were wholly erratic. Statistical studies indicated that these changes constituted increases of the standard deviation of angles of divergence of twice to over three times the normal, but that the average angle of divergence in treated plants was usually not significantly changed from the normal. The treated shoot apexes behaved like fasciated shoot apexes in producing multiple leaves and had abnormal phyllotaxy, but they differed in that they never underwent the enormous lateral extension that characteristically produced a "vegetative line" in fasciations. The axillary buds of the double leaves, however, agreed closely with the descriptions of spontaneously occurring fasciated shoot apexes; there was lateral expansion of the meristem to produce a vegetative line. There appeared to be a direct correlation between the circumferential extent of this meristem and the width of the multiple leaf base. The most effective concentration of indoleacetic acid was 1 percent; that for indolepropionic, 3 percent. After a short period of abnormal growth under the influence of the growth substance, the shoot apexes recovered both their normal anatomy and their normal growth habits; this was considered evidence of the independent, self-determining nature of the shoot apex. It is suggested that there is an attraction of additional nutrients and other substances to the treated shoot apexes as a result of applying growth substances, and that these materials may be the cause of the abnormal growth habit. There are 51 references.

Auxin, water uptake, and osmotic pressure in potato tissue, J. VAN OVERBEEK (*Amer. Jour. Bot., 31 (1944), No. 5, pp. 265–269, illus. 2*).—Under aseptic conditions of experimentation, it was shown that indoleacetic and naphthaleneacetic acids induce increased water uptake, as measured by the increase in wet weight of potato tissue. This auxin-induced water uptake could be demonstrated in distilled water as well as in mannitol or sucrose solutions. The expressed sap of auxin-treated tissues was found to have a lower osmotic concentration than that of control tissues. Hence an increased osmotic pressure either by salt absorption or by starch hydrolysis is ruled out as a cause of auxin-induced water uptake in potato cells. The only alternatives left are an auxin-induced decrease in wall pressure of the storage cells, an auxin-induced increase in nonosmotic water uptake, or both.

Some telemorphic effects induced in sweet pea by application of 4-chlorophenoxyacetic acid, J. M. BEAL (*Bot. Gaz., 105 (1944), No. 4, pp. 471–474, illus. 6*).

A comparison of the kinetics of enzymatic adaptation in genetically homogeneous and heterogeneous populations of yeast, S. SPIEGELMAN and C. C. LINDEGREN (*Ann. Missouri Bot. Gard., 31 (1944), No. 2, pp. 219–233, illus. 3*).—Data are presented on the kinetics of the replacement of a phenotype incapable of fermenting galactose by one that can acquire the property in genetically unstable

haploid populations growing on galactose agar. The nature of the time variation of the ratio of the two types is shown to fit a relation deduced from a selection theory. This was compared with data on a diploid strain not obeying the predicted relation. The kinetics of the increase in enzyme activity of the haploid populations was studied and shown to depend on the number of new cells arising. A similar study on a diploid strain showed that increase in enzyme activity could take place in the absence of cell division. The general significance of these results for the problems of enzymic synthesis and the induction of new physiological properties in populations of cells is discussed.

Cytochrome C and cytochrome oxidase from wheat germ, D. R. GODDARD (*Amer. Jour. Bot., 31 (1944), No. 5, pp. 270–276, illus. 4*).—Cytochrome C was isolated from wheat germ in amounts of 4.6 mg. per kilogram dry weight; it had the same absorption spectrum as heart cytochrome C. That from wheat was catalytically oxidized by heart or wheat cytochrome oxidase and catalytically reduced by cytochrome reductase. An improved method of extraction of cytochrome oxidase from wheat germ is presented; the oxidase was insoluble and had not been put into solution by treatment with ultrasound waves. The method of cytochrome C assay by the manometric method was improved to the point of sensitivity to 10 μg. of cytochrome C.

Cell physiological studies of frost resistance: A review, G. W. SCARTH (*New Phytol., 43 (1944), No. 1, pp. 1–12*).—This review (31 references) considers the mechanism of frost injury and resistance in plants, modes and moments of injury, osmotic pressure, nonsolvent space, bound water content, cell permeability, protoplasmic viscosity, coagulation, the cell surface, correlation of protoplasmic properties with hardiness, and the physicochemical nature of hardening changes.

A critical examination of new theories of the metabolism of major nutritive elements in plants, F. J. RICHARDS (*Ann. Bot. [London], n. ser., 8 (1944), No. 29, pp. 43–55, illus. 3*).—The author concludes that without further experimental evidence, supplemented by adequate statistical analysis, it would appear that the water-content relations and the partitioning between soluble and insoluble fractions of N, P, and carbohydrate are more complex phenomena than envisaged by Mason and Phillis (E. S. R., 89, p. 644), as the work done at his own institution is believed to have demonstrated.

Physico-chemical properties of the surface of growing plant cells, H. LUNDEGÅRDH and G. STENLID (*Nature [London], 153 (1944), No. 3890, pp. 618–619, illus. 2*).—A brief discussion, with seven references.

The "negative group effect" in the pollen grains of Vinca rosea, H. W. BEAMS and R. L. KING (*Jour. Cell. and Compar. Physiol., 23 (1944), No. 2, pp. 39–45, illus. 6*).—When groups of 50 or more pollen grains of Madagascar periwinkle were germinated on an artificial medium at pH 6.2–7.8, over 67 percent of the peripherally placed grains formed tubes on their sides away from the mass, thus showing a negative group effect. The polarity of the grains as determined by the origin of the pollen tubes was not affected by a gradient of H ions but pH values did affect the growth rate of the tubes. There are 15 references.

Relation between electrical and curvature responses in the Avena coleoptile to mechanical stimuli, A. R. SCHRANK (*Plant Physiol., 19 (1944), No. 2, pp. 198–211, illus. 5*).—An apparatus to hold oats (*A. sativa*) coleoptiles horizontally without mechanical stimulation or disturbance of the vertical position of the electrodes is described. When the apical 10 mm. of one side of the coleoptile were mechanically stimulated at 5-min. intervals, bending occurred toward the side stimulated; similar mechanical stimulation changed the electromotive force of the stimulated side so that it became electronegative to the nonstimulated side at points 2 mm. below the apex. When the coleoptile was placed horizontally, the upper side

became negative to the under side long before any geotropic curvature or difference in hormone concentration on the two sides had been demonstrated. Mechanical stimulation of the apical 10 mm. of the upper side failed to prevent its normal geotropic curvature, but simialr mechanical stimulation on the lower side inhibited the upward curvature for at least 75 min. without detectable injury to the plant. The transverse electrical polarity of the coleoptile in the horizontal position was also altered by mechanical stimulation of the apical 10 mm. at 5-min. intervals. When the upper side was stimulated, it became negative to the lower side; the magnitude of this mechanically induced potential difference was greater than in the mechanically nonstimulated coleoptile in the hoirzontal position. When the lower side was mechanically stimulated, it became negative to the upper side; this induced transverse electrical polarity was opposite in orientation to the transverse electrical polarity induced in the coleoptile by gravity and was associated with inhibition of the curvature normally induced by gravity. These simple preliminary experiments suggest an intimate linkage between the promptly established transverse electrical polarity and the subsequent growth curvature in the oats coleoptile. There are 20 references.

Chemical composition of roots and tops of dioecious Lychnis in vegetative and flowering phases of growth, J. F. Stanfield (*Plant Physiol., 19 (1944), No. 2, pp. 377–383*).—Dioecious forms, such as *L. dioica,* appear to have the advantage in studies of problems of nutritional ontogeny and the evident influence of reproductive processes thereon in permitting recognition of compositional and metabolic differences associated with sex expression. Results of analyses of roots v. tops of this plant in both vegetative and flowering stages indicated the following: Roots and tops of ♂ plants were characterized by higher P and total sugar contents in both vegetative and early flowering phases. A higher metabolic rate, as shown by phenoloxidase activity in the press sap of tops and roots, was indicated for ♀ plants in the early flowering phase. The entire root systems of ♂ plants had a greater fresh weight than those of the ♀ in both vegetative and flowering phases Roots of ♀ were higher than the ♂ in percentage of total ash in both growth phases; in tops the reverse was true. No definite tendencies correlated with sexual expression were shown in percentages of dry weight, hydrolyzable polysaccharides, and total N; nor did the pH of press sap show any correlation with sex. Roots had a comparatively higher phenoloxidase activity than the tops of both sexes in vegetative and flowering phases. In both sexes, the tops had a higher total N content than the roots in the two growth phases. Soluble carbohydrates were higher in the roots of the rosette stage; in the early flowering stage they were predominantly in the form of hydrolyzable polysaccharides in both sexes. There are 21 references.

Effects of variation in nutrient solution on growth of sunflower plants, S. V. Eaton (*Bot. Gaz., 105 (1944), No. 4, pp. 425–435, illus. 1*).—By means of sand cultures, solution 3 (IR2S4 of the Livingston triangle, osmotic pressure 1 atmosphere (E. S. R., 44, p. 130), was compared in the growth of sunflower with its dilutions and with solutions of other investigators, six solutions being compared. Plants grown with solution 5, that of Hoagland et al. (E. S. R., 50, p. 813), were the largest of any series—17 percent larger than those of solution IR2S4. Its superiority was believed due to its nearly optimum concentration (about 0.7 atmosphere osmotic pressure), its low phosphate content in proportion to nitrate, and its low Mg concentration in relation to Ca. Plants of solutions 1, 2, and 6 (about 0.25, 0.50, and 0.50 atmosphere, respectively) were smaller than those of IR2S4. Expressed in percentages, the range was 44.92 smaller for solution 1 of the first crop to 8.10 for solution 2 of the same crop, the other differences being between these extremes. These three solutions were probably too dilute for the

best growth of sunflower; on the other hand, IR2S4 seemed too concentrated. The composition of solution 4 was the same as IR2S4, except that it was somewhat lower in $Ca(NO_3)_2$. This would be expected to decrease rather than increase growth, yet probably because of a more optimum concentration the plants in solution 4 (about 0.9 atmosphere) were larger by 5–9 percent than those of IR2S4. Both solutions 3 (IR2S4) and 4 produced plants inferior to those of 5; this was probably due to their higher concentrations and larger contents of phosphate and Mg. The pH of the drip of solution 5 was higher than that of any other solution, most of the determinations showing an alkaline reaction; this high pH was owing to the facts that all the N was supplied as nitrate and the content of potassium phosphate was low. Solution 6, that of Shive and Robbins (E. S. R., 78, p. 599), contained a little $(NH_4)_2SA_4$, and the pH of its drip did not rise so high and showed less fluctuation than any other solution used. Because of higher temperatures and more sunshine, plants of the second harvest were considerably larger than those of the first; their increased growth as compared with the latter was greater for the roots than for the tops, so that the top:root ratios of the second crop were smaller. There are 22 references.

Correlation between internal surface and transpiration rate in mesomorphic and xeromorphic leaves grown under artificial light, F. M. Turrell. (Calif. Citrus Expt. Sta.). (*Bot. Gaz., 105 (1944), No. 4, pp. 413–425*).—Periwinkle (mesomorphic) and oleander (xeromorphic) plants were grown under two ranges of intensity of artificial light—86–300 and 301–965 footcandles. Both types of leaves developed a significant degree of xeromorphy under high intensity, as judged by the relative increase in palisade thickness. The oleander leaves had significantly greater internal-external surface ratios than those of periwinkle; leaves of both grown under high intensity had significantly larger internal-external surface ratios than when grown under low intensity light. Transpiration rates of both species were measured by weighing in potometers. When all plants were treated statistically as a group, correlations between the internal-external surface ratios and the transpiration rates were high and obtained whether transpiration was measured under low (minimum 77 footcandles), under high (minimum 175), or under the light intensity in which the plants were grown, when in the last case correction was made for radiation. Individual comparisons, however, were often not significant. The xermorphic leaves of oleander had greater transpiration rates than the mesomorphic leaves of periwinkle per unit external leaf surface, as predicted from evaporation equations for free-water surfaces; but computations of transpiration per unit of internal leaf surface indicated other factors also responsible for the greater transpiration rate in xeromorphic leaves. There are 23 references.

Formation of hydrogen ions in high concentration by ordinary baker's yeast, E. J. Conway and E. O'Malley (*Nature [London], 153 (1944), No. 3891, p. 652*).—The point of special interest in these experiments on glucose fermentation by yeast was the direct exchange of K for H-ions, the latter reaching surprisingly high levels.

Cation exchanges in Chlorella pyrenoidosa, G. T. Scott (*Jour. Cell. and Compar. Physiol., 23 (1944), No. 2, pp. 47–58, illus. 2*).—The mineral constituents of this one-celled green alga grown in Detmer's solution were not removed by resuspending the cell in distilled water. Potassium was firmly bound by the cell and could not be removed by washing in mineral solutions containing Na, Ca, or Mg salts. Resuspension in Ca-free solutions containing Mg salts caused a drastic reduction in the intracellular Ca; K or Na salts caused a partial displacement of Ca. A definite amount of Mg was firmly bound by the cell and could not be removed by resuspension in Mg-free solutions containing Ca salts. It was calculated that this bound Mg was in excess of that contained in the chlorophylls. The

ratio of Ca and the replaceable Mg in the cell was determined by their ratio in the washing solutions, and this relation may be expressed by the mass-action law proportionality. The hypothesis is advanced that intercellular constituents possess different affinities for Na, K, Ca, and Mg, and that these elements combine with organic compounds of very low mobility in the protoplasm whose salts have different dissociation constants.

Ionic absorption by tomato plants as correlated with variations in the composition of the nutrient medium, K. C. BEESON, C. B. LYON, and M. W. BARRENTINE. (U. S. D. A.). (*Plant Physiol., 19 (1944), No. 2, pp. 258–277, illus. 8*).—In an inbred strain of Bonny Best tomato grown in sand culture, the effects of nutrient solutions varying in the relative proportions of macronutrient cations were studied and the data reduced and analyzed by statistical methods. Variations in the relative proportions of these cations supplied in the medium resulted in large differences in the mineral composition of both fruit and vegetative material, the composition of the tissues being correlated with that of the medium. The concentration of any given element in the tissues was in many instances not only correlated with the supply of that element alone in the medium but also with the supply of other ions. In the leaflet material the Ca concentration was positively correlated with the Ca^{++} and negatively with the K^{+} supplied; K concentration was positively correlated with the K^{+} and negatively with the Ca^{++} supplied; Mg was positively correlated with the Mg^{++} and negatively with the Ca^{++} supplied; P was positively correlated with the Mg^{++} supplied; and neither N nor S concentration was significantly correlated with the supply of any macronutrient cation. In the fruit material, Ca concentration was positively correlated with the Ca^{++} supplied; K was positively correlated with the K^{+} supplied; and Mg was negatively correlated with the Ca^{++} supplied. No significant correlation with the Mg^{++} supplied was observed. When the relative amounts of leaflet and fruit material produced on each plant were considered, the total uptake of a given element by these tissues showed the same trends as those observed for the concentration of the element in the tissue. There are 19 references.

Anatomical responses of tomato stems to variations in the macronutrient cation supply, C. B. LYON and C. R. GARCIA. (U. S. D. A. and Univ. P. R.). (*Bot. Gaz., 105 (1944), No. 4, pp. 441–456, illus. 7*).—The effects of 43 nutrient solutions varying in relative proportions of the macronutrient cations, Ca, K, and Mg were studied in relation to the anatomy of stems of an inbred strain of Bonny Best tomatoes grown in sand culture, the data obtained being reduced and analyzed by statistical methods. Great differences in stem diameter and actual area of each of the component tissue systems were positively correlated with K and negatively with Ca supply. Significant differences between treatments occurred with respect to the relative areas of the constituent tissue systems in the stem sections; these differences could also be correlated with nutrient composition. Cell size and relative thickness of cell walls in pericyclic fibers could be associated with Ca ion supply. Cellular differences were also seen in pith parenchyma, in internal and external pericyclic fibers and phloem, and in cortical chlorenchyma and collenchyma; they are described and correlated with the supply of one or more ions in the nutrient medium. Differences in the anatomy of the tomato stems were significantly correlated with characteristics used as criteria of vegetative growth and fruitfulness. For example, the relative amount of phloem in stem sections was positively correlated with vegetative growth, whereas the relative amount of xylem was positively correlated with fruitfulness.

Lipid production by a soil yeast, R. L. STARKEY. (N. J. Expt. Stas.). (*Jour. Bact., 47 (1944), No. 6, pp. 579–580*).—An abstract.

Some chemical reactions of sulphur dioxide after absorption by alfalfa and sugar beets, M. D. Thomas, R. H. Hendricks, and G. R. Hill (*Plant Physiol., 19 (1944), No. 2, pp. 212–226, illus. 2*).—This is the fifth of a series of papers (E. S. R., 89, p. 646) on the effect of prolonged low concentrations of SO_2 on plants. In SO_2 fumigation experiments on alfalfa (1935–36, 1939–41) and sugar beets (1943), prolonged low concentration failed appreciably to change the pH of the expressed leaf juices, but reduced perceptibly their buffer capacity as shown by electrometric titration. Organic bases in the leaf are believed principally responsible for neutralizing the absorbed acid; the data suggested a slow restoration of the buffer capacity. The absorbed SO_2 was changed principally to sulfate. A small amount of organic S was produced, including cystine or related "labile" S compounds and probably also other soluble and insoluble organic S compounds. Labile S was consistently higher in the fumigated than in the nonfumigated plats of 1935-1936 and generally higher in the later work also. When the nutrient solution was deficient in sulfate, the fumigated leaves had considerably more labile S than the nonfumigated leaves. The differences between the labile S values of the fumigated and nonfumigated plats were small when the S available to the roots was adequate. The roots of sugar beets had only about one-tenth the labile S in the leaves, but showed differences due to the various S treatments similar to those in the leaves. The high nutrient-low S nonfumigated plats had very low labile S values in the leaves of both alfalfa and sugar beet—considerably lower in fact than the low nutrient-low S plats, suggesting a lack of balance as well as a deficiency in the former plats.

A study of the sulphur metabolism of wheat, barley, and corn using radioactive sulphur, M. D. Thomas, R. H. Hendricks, L. C. Bryner, and G. R. Hill (*Plant Physiol., 19 (1944), No. 2, pp. 227–244, illus. 2*).—Mixed plats of wheat and barley growing in nutrient solution deficient in sulfate and corn in nutrient adequately supplied with S were either treated with radioactive $Na_2S^*O_4$ (* = radioactive S) in the solution or were fumigated with active S^*O_2. Results with S-deficient wheat and barley indicated high initial absorption of S^*O_2 in the leaves followed by a lowering of the concentration as the S* was distributed throughout the plant. There was rapid absorption of $Na_2S^*O_4$ from the solution, to build up a maximum concentration in the leaves in about 8–10 days, followed by steady lowering of the concentration as this S* also was distributed. Concentration in the tops was greater than in the roots. Translocation to the grain of 60–80 percent of the S* occurred during ripening. Conversion of most of the S^*O_2 and $Na_2S^*O_4$ to organic forms occurred rapidly. In the leaves the acid soluble and acid insoluble organic fractions predominated, but appreciable amounts of labile and sulfate S* were also present; in other parts of the plant the predominating fractions were as follows—stems, sulfate; roots, the acid soluble fraction; and kernels, the labile and acid soluble fraction, with only a little of the acid insoluble fraction and sulfate*. Evidently the organic S* in the leaves was changed to sulfate for purposes of translocation and then changed back again to organic forms in the roots and grain; in this transfer to the grain, the labile fraction was greatly increased.

In corn growing in a nutrient solution adequately supplied with sulfate, absorption of active sulfate* was much slower than in wheat and barley growing in sulfate-deficient solution, but higher concentrations of sulfate* were generally present in the corn. Sulfate* was a particularly important constituent of the corn leaves for several days after the S^*O_2 fumigation. In corn, the greatest S* concentration was found in the leaves and the least in the stalks and husks. The ripening process, however, was not far advanced at the end of the season and the distribution at maturity could not be established.

Radioautographs showing the distribution of sulphur in wheat, B. F. Harrison, M. D. Thomas, and G. R. Hill (*Plant Physiol., 19 (1944), No. 2, pp. 245–257, illus. 5*).—Radioautographs were made of the leaf and kernel of spring wheat which had absorbed radiosulfur (S*) either from the nutrient solution as sulfate* or from the air as S^*O_2. In the leaf, S* was distributed rather uniformly. In the kernel, sampled at the dough stage 2–5 weeks after S* treatment, there was a much greater concentration of S* than in any other part of the plant; further, there was a marked concentration in the embryo and also in the periphery of the endosperm, particularly in the aleurone layer and immediately underneath. An appreciable amount of S* was distributed rather uniformly throughout the interior of the endosperm, but the pericarp was nearly free of activity. The distribution of S* was evidently similar to that of the protein. There was little if any difference in the distribution due to treating the plants with S^*O_2 rather than $Na_2S^*O_4$. There are 16 references.

Accumulation of anabasine in reciprocal grafts of Nicotiana glauca and tomato, R. F. Dawson (*Amer. Jour. Bot., 31 (1944), No. 6, pp. 351–355*).—Anabasine accumulated in appreciable amounts in tomato scions grown on *N. glauca* roots as well as the reverse grafts. Nicotine accumulated in small amounts in tomato scions grown on *N. glauca* roots, though this alkaloid could not be detected in intact plants of *N. glauca*. From these and other data recorded in the literature it is concluded that nicotine production is limited to the roots of *N. glauca* as it is also localized in these organs of *N. tabacum*. On the other hand, anabasine seems to be formed in both root and shoot of *N. glauca* independently. Finally, it is concluded that—potentially at least—the total anabasine content of the shoot of *N. glauca* may be derived in part from synthesis in situ and in part from accumulation of the alkaloid translocated to the shoots from the roots. The alkaloids were isolated and identified as the crystalline dipicrates.

The Hottentot fig as a possible commercial source of tannin, T. Y. Hum and R. Pratt (*Plant Physiol., 19 (1944), No. 2, pp. 384–386*).—*Mesembryanthemum eduli* is shown to be a good commercial source of tannin of the catechol or phlobotannin type, dry leaves and stems containing 19.4 and 14.16 percent, respectively. Mixtures of the two yielded 17.1 percent tannin, and it is estimated that average stands of the plant in California should yield about 1,500 lb. of tannin per acre. Tanning from this plant could be used in the manufacture of leather, yielding a product without bloom; it is also probable that, in conjunction with other tannins or materials, different classes of leather could be made. The sap and aqueous extract have mild antiseptic properties; the latter, coupled with the great astringency, would seem to afford a potentially useful therapeutic combination.

The four-carbon respiratory system and growth of the mold Neurospora, F. J. Ryan, E. L. Tatum, and A. C. Giese (*Jour. Cell. and Compar. Physiol., 23 (1944), No. 2, pp. 83–94, illus. 8*).—Both growth and respiration of *N. crassa* were inhibited by iodoacetic acid; at concentrations completely preventing growth there was a residual respiration of about 30 percent. The inhibitions of growth and respiration were reversed by succinic acid. The effects of these acids on growth were quantitatively similar to their effects on iodoacetic-sensitive respiration. It is concluded that a respiratory mechanism involving the C_4-dicarboxylic acids supplies energy for the growth of this fungus.

The respiratory gradient in barley roots, L. Machlis. (Univ. Calif.) (*Amer. Jour. Bot., 31 (1944), No. 5, pp. 281–282, illus. 1*).—When the oxygen consumption and CO_2 evolution of cut segments of barley root were measured, the respiratory rate was found to decrease with increasing distance from the root apex. The respiratory quotients of the different regions of the root were equal.

Radiation and plant respiration, R. L. Weintraub (*Bot. Rev., 10 (1944), No. 7, pp. 383–459*).—This critical review (332 references) is believed to support the conclusion that, under some conditions, an increase in rate of "apparent" respiration, as measured by gaseous exchange, may be induced by irradiation of various species of plants and types of plant tissues. In the present elementary state of knowledge it cannot be decided with certainty whether or not the observed stimulations are directly related to the "true" respiration. Despite the long-continued interest in this problem, the results thus far available are almost entirely of a descriptive nature, and in no case has there yet been presented a satisfactory elucidation of the mechanism involved. From consideration of the diverse conditions and types of material with which an alteration of the gaseous exchange has been observed, it seems to the author altogether likely, however, that such an effect may be the common end result produced by a variety of phenomena.

Apparent equilibrium between photosynthesis and respiration in an unrenewed atmosphere, M. D. Thomas, R. H. Hendricks, and G. R. Hill (*Plant Physiol., 19 (1944), No. 2, pp. 370–376, illus. 5*).—The minimum concentration of CO_2 to which an unrenewed atmosphere could be reduced by photosynthesis was sought, a value of 40 p. p. m. being found for sugar beets at 15° C. The apparent equilibrium between photosynthesis and respiration depended on the temperature and light intensity. In grain and sugar beet experiments, the minimum equilibrium concentration agreed satisfactorily with values calculated from independent respiration and photosynthesis data. It is believed that the method should prove useful for fundamental studies in this field.

A chamber for growing plants under controlled conditions, K. C. Hamner (U. S. D. A.). (*Bot. Gaz., 105 (1944), No. 4, pp. 437–441, illus. 4*).—The chamber devised and here described and illustrated is illuminated by fluorescent lamps; in it several species of plants have been grown from seed to maturity. Several of these chambers have been in actual operation for over a year with satisfactory results.

Observaciones sobre la biología floral de Solanum chacoense Bitter, E. L. Ratera (*Buenos Aires Univ., Rev. Facult. Agron. y Vet., 10 (1943), No. 3, pp. 451–457, illus. 6; Eng., Portug. abs., p. 456*).—*S. chacoense* is found to be a self-fertile species, flowering and fructifying abundantly in the Buenos Aires region. The position taken by the flowers at twilight and during the night favors self-pollination, and the anthers mature about simultaneously with the receptive period of the stigmas.

Heterokaryosis in Penicillium notatum Westling, G. E. Baker (*Jour. Bact., 47 (1944), No. 6, p. 581*).—An abstract.

A karyosystematic study of the genus Agave, E. B. Granick (*Amer. Jour. Bot., 31 (1944), No. 5, pp. 283–298, illus. 34*).—The chromosome counts of 31 species of *Agave* from somatic metaphase plates are presented and discussed, and a table summarizes all available chromosome counts in the *Yucca-Agave* group of plants. The karyotypes of the latter group are believed indicative of generic relationship. From evidence obtained in a study of the karyotypes of various genera of monocotyledons, a line of ascent is postulated from primitive monocotyledons such as the Butomales up through a rhizomatous liliaceous stock like *Hosta* to the Agavaceae.

Organogenesis in Rubus, C. J. Engard (*Hawaii Univ., Res. Pub. No. 21 (1944), pp. 234+, illus. 449*).—The purpose of this monographic work was to present the results of a thorough study of the origin and development of all tissues, organs, and appendages of lower rank in four species of *Rubus* and to correlate the ontogenesis with physiological relationship to the organism. The author stresses the correlation of form and function which, with consideration of evolutionary change

in each, serves as the basis of the true philosophy of morphology. There are 141 references.

Potato roots inside potato tubers, P. A. YOUNG. (Tex. Expt. Sta.). (*Amer. Jour. Bot., 31 (1944), No. 6, p. 368, illus. 1*).—Roots grew from the eyes inward through the white starchy tissues and also made ridges under the peel of potato tubers that had been stored for 4 mo. on warm dry sand under a barn, summer of 1943.

Morphological identity of the velamen and exodermis in orchids, C. J. ENGARD. (Univ. Hawaii). (*Bot. Gaz., 105 (1944), No. 4, pp. 457–462, illus. 10*).

Wood structure of Libocedrus decurrens, M. W. BANNAN (*Amer. Jour. Bot., 31 (1944), No. 6, pp. 346–351, illus. 24*).—The trends in anatomical variation in different parts of the tree were found to resemble those previously described for *Thuja occidentalis* (E. S. R., 87, p. 66) and *Juniperus virginiana* (E. S. R., 87, p. 495); detailed results of the study are described and illustrated.

GENETICS

A statistical problem, M. DELBRÜCK (*Jour. Tenn. Acad. Sci., 19 (1944), No. 2, pp. 177–178*).—A statistical problem of fundamental importance to the study of bacterial mutations is here presented.

Recent studies on inheritance of quantitative characters in plants, H. H. SMITH. (U. S. D. A.). (*Bot. Rev., 10 (1944), No. 6, pp. 349–382*).—A comprehensive review, with 227 references.

A hybrid between Hordeum jubatum and Secale cereale reared from an artificially cultivated embryo, R. A. BRINK, D. C. COOPER, and L. E. AUSHERMAN. (Wis. Expt. Sta.). (*Jour. Hered., 35 (1944), No. 3, pp. 67–75+, illus. 5*).—Seeds from *H. jubatum* ($n = 14$) $\times$ *S. cereale* ($n = 7$) did not develop to a germinable condition, growth ceasing at from 6 to 13 days after fertilization. A seedling developed on an artificial nutrient medium from 1 of 81 embryos dissected from 9- to 12-day old hybrid seeds was potted and grown to maturity. The hybrid had 21 chromosomes, was intermediate between parents in growth habit, and sterile. Diakinesis stages in the hybrid usually showed 5 loosely associated bivalent and 11 univalent chromosomes. Chromosome bridges were common between the interphase nuclei. There was little homology between the parental sets of chromosomes. The findings point to the practicability of rearing various first-generation interspecific hybrids and derivatives of them, which ordinarily die in the seed, by excising the immature embryos and cultivating them artificially.

Comparison of shoot apex and leaf development and structure in diploid and tetraploid maize, L. F. RANDOLPH, E. C. ABBE, and J. EINSET. (U. S. D. A. coop. Cornell Univ., Univ. of Minn., et al.) (*Jour. Agr. Res. [U. S.], 69 (1944), No. 2, pp. 47–76, illus. 5*).—The shoot apex of tetraploid corn plants during the tenth plastochron (the time interval during which the leaf primordium is differentiating from the shoot apex) had the same number and arrangement of cells as in corresponding diploid plants, but the volume of nuclei and cells was doubled. Due to larger cell size, the tetraploid shoot apex was correspondingly larger and the tenth leaf initial, originating as a ridge of tissue almost surrounding the base of the shoot apex, was correspondingly wider than in diploid plants. The tetraploid leaf initial was wider at time of origin, and this original difference in width for any given length was maintained throughout ontogeny, although the rate of increase in width and length was slower in the tetraploid than in the diploid leaf. The tetraploid leaf at maturity was about as long as the diploid, about 1.16 times as wide, and 1.35 times as thick, its volume being 1.6 times that of the mature diploid leaf. Cells in the mature leaf blade were estimated to total about 143 $\times$

10^6 in tetraploid and 154 × 10^6 in diploid plants. Cell volume in the tetraploid averaged about 1.6 times that of the diploid, but this relationship was not maintained from region to region. Relationship between cell dimensions in the diploid and tetraploid leaf blade was extremely variable in various tissues in the same and different regions of the leaf.

Absence of consistent relation between dimensions of the mature leaf and its constituent cells, as existed in undifferentiated tissues of the shoot apex, suggested that the cell may exert a more potent influence on organ pattern in relatively simple embryonic structures than in more highly specialized organs of the mature plant. The concept of an "ideal gigas state" was developed as an aid in the interpretation of the diverse effects of chromosome doubling. Significance of doubling the number of chromosomes v. doubling the number of specific genes in relation to their possible influence on the morphology of tetraploid and diploid corn is discussed.

The effect of X-rays upon dominant mutation in maize, L. J. STADLER. (U. S. D. A. and Mo. Expt. Sta.). (*Natl. Acad. Sci. Proc., 30 (1944), No. 6, pp. 123–128*).—X-ray treatment of corn ears, 73–81 hr. after pollination, failed to induce mutation of *a* to *A* (or to any other colored aleurone allel), in populations which, with the X-ray doses applied, could yield about 900,000 losses of *A* by deficiency or by mutation to a colorless allel. The *a* genes used, when combined with *Dt,* yielded numerous mutations to *A* or other colored aleurone allels. The population irradiated was large enough to have yielded, under the influence of homozygous *Dt,* about 400,000 of such mutations.

Inviability of intergeneric hybrids involving Triticum monococcum and T. aegilopoides, E. R. SEARS. (U. S. D. A. coop. Mo. Expt. Sta.). (*Genetics, 29 (1944), No. 2, pp. 113–127, illus. 4*).—Two allels identified in *T. monococcum* which act as dominant lethals in hybrids with *Aegilops umbellulata* are without effect in *T. monococcum* itself and differ in the earliness with which they cause death. A third normal allel is present in the closely related *T. aegilopoides.* Multiple hybrids combining the normal allel and one inviability factor with the *A. umbellulata* genome are viable. Semilethality occurs in hybrids of *A. bicornis* with certain *Triticum* varieties, while hybrids with another variety are viable. This inviability apparently is determined monofactorially. Noncrossability of *T. monococcum* with *Haynaldia villosa* also appears to be simply inherited.

Inheritance of chlamydospore and sorus characters in species and race hybrids of Tilletia caries and T. foetida, C. S. HOLTON. (U. S. D. A. and Wash. Expt. Sta.). (*Phytopathology, 34 (1944), No. 6, pp. 586–592, illus. 2*).—In some hybrids between *T. caries* and *T. foetida* the smooth character of *T. foetida* spores was completely dominant over the reticulate character of *T. caries* spores; in other hybrids reticulate was partly dominant over smooth. Variability in type of reticulations and size of spores was observed in the F_1 of certain hybrids between races of *T. caries.* Segregation and recombination of factors for chlamdospore characters occurred in the F_2 of hybrids between *T. caries* and *T. foetida* and between races within species. Spores resembling both parents and those differing distinctly from both parents usually were recovered in the F_2. In one species hybrid smooth-type spores of the *T. levis* parent were not recovered in the F_2. Evidence is presented indicating that size and shape of sori in *T. caries* and *T. foetida* are, at least in part, genetically controlled.

Inheritance of dwarfness in common wheat, W. K. PAO, C. H. LI, C. W. CHEN, and H. W. LI (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 417–428, illus. 1*).—Dwarf wheat plants were obtained in F_2 of crosses between Quality and P165 (from India) and between P165 and 25V112 (Italy) and were also found in other crosses. Results may be explained on the assumption of an interaction of complementary factors D_1, D_2, and D_3 and duplicate factors D'_1 and D'_3, with an inhibitor,

I. Presence of all three complementary factors or a substitute of the respective duplicate factor is needed for manifestation of dwarfs. Recessive condition of one of these three essential factors or presence of I with the three essential factors for dwarf plants results in normal plants. Duplicate factor D'_2 is postulated in explaining results obtained from crossing Onas × Fawn to Quality and Peiteng × Fawn to Quality. Probable genetical constitution of different parents used is tabulated.

Branched heads in wheat and wheat hybrids, B. C. Sharman (*Nature [London], 153 (1944), No. 3886, pp. 497–498, illus. 1*).—It is believed from the data briefly presented that the branched-headed factor operates by altering the branched/normal-headed threshold and so can be made to behave as either a dominant or a recessive at will.

The combination of stem rust resistant genes from the wheats Eureka and Warigo, A. T. Pugsley and I. F. Phipps (*Jour. Austral. Inst. Agr. Sci., 9 (1943), No. 3, pp. 130–132*).—Eureka and Warigo are two new Australian stem rust-resistant wheat varieties deriving this character from Kenya C. 6040 and Hope, respectively. Since both are being used in further breeding work, it is important to know something of the genes involved; the literature on these is reviewed (6 references). The authors record the successful combination of a "physiologic resistance" gene from Eureka and a "mature plant resistance" gene from Warigo by use of the short-cut method; it is anticipated that this double resistance will prove superior and more stable than the resistance of either parent alone.

Amphidiploidy in Triticum-Agropyron hybrids, J. M. Armstrong and H. A. McLennan (*Sci. Agr., 24 (1944), No. 6, pp. 285–298, illus. 11*).—Sterility in *Triticum* spp. × *A. glaucum* hybrids was overcome by inducing chromosome doubling by colchicine treatments of the F_1 seed. Chromosome pairing and stability was found to be improved in F_3 progenies over that of F_2 plants. A significant correlation, found in F_3 plants between chromosome number and fertility, favored stabilization at the higher chromosome numbers.

La biología floral del girasol y su relación con la técnica del mejoramiento [The floral biology of sunflower and its relation to breeding technic], J. A. Etchecopar (*Rev. Argentina Agron., 11 (1944), No. 1, pp. 11–19, illus. 2; Eng. abs., pp. 18–19*).—The following conclusions are drawn from a 3-yr. study: Fertilization may be effected when the stigma lobules diverge and bend, exposing the receptive surface. The best method of castration consisted of eliminating the bisexual floral anthers the day after opening of the marginal flower, thus exposing the lobules of the closed stigmas free of pollen. The stigmas were receptive within the 5 days starting from the pollination date. In controlled pollination, good results were obtained with a cotton brush, renewed with each operation. Pollen kept at the temperature of the environment remained viable for 10 days.

Further comparisons of plants with different chromosome numbers in respect to chemical composition, J. T. Sullivan. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 6, pp. 537–543*).—Chemical analyses made of diploid and tetraploid perennial ryegrass (E. S. R., 82, pp. 478, 607) revealed that in field rows tetraploid plants were lower in percentage dry matter and higher in sucrose and total sugars and in proportion of dry matter soluble in alcohol. Plants in culture solutions in the greenhouse gave similar results, except that tetraploid plants were lower in percentage dry matter only in respect to younger clippings and were higher in sugars only in more mature clippings. In white clover, octoploid plants were lower in fiber and in carotene than tetraploid plants. Differences in chemical composition found associated with an increase in chromosome number were of statistical significance in cases stated but not of great magnitude. In general, an increase in chromosome number was often associated with an increase in moisture

and in the soluble constituents and with a decrease in the structural constituents. The reverse association was not found.

Interspecific hybridizations of Bromus, P. F. KNOWLES. (Univ. Calif.). (*Genetics, 29 (1944), No. 2, pp. 128–140, illus. 3*).—Attempts to combine soft chess (*B. mollis*) with 13 other species of brome, representatives of five different sections of the genus, resulted in production of hybrid plants in *B. mollis* × *racemosus, B. mollis* × *arenarius, B. mollis* × *rubens, B. mollis* × *madritensis, and B. mollis* × *carinatus.* The extent of chromosome pairing in the hybrids paralleled the extent of morphological similarity of parental species. Differences between two morphologically distinct hybrids of *B. mollis* × *carinatus* was deemed genic in basis. Chromosome numbers are reported for the first time for *B. arenarius* ($2n = 28$); *B. racemosus* ($2n = 28$); and *B. trinii* ($2n = 42$).

The genetic organization of leaf-shape development in the genus Gossypium, S. G. STEPHENS (*Jour. Genet., 46 (1944), No. 1, pp. 28–51, illus. 18*).—Leaf shape in *Gossypium* is controlled by series of multiple allels, and, by plotting logarithmically dimensions of fully expanded leaves at successive nodes on the main stem, developmental tracks may be constructed which are characteristic for each allel. Extensive study of 16 leaf shapes suggested that developmental tracks of all lobed-leaved types throughout the genus can probably be induced to pass through three phases. In a linear phase, A, in which leaf length, sinus length, and lobe width develop at equal rates ($K = 1$), the leaf is entire. During the transition phase B, in which development of leaf length and sinus length shows a nonlinear relationship, localized areas of restricted growth are established in the leaf primordia (K values vary continuously), and as a result the entire is converted into a lobed-leaf pattern. In a second linear phase, C, in which leaf length, sinus length and lobe width develop allometrically (K stabilized at < 1), each allel has its characteristic K value. Entire-leaved types remain in phase A during normal developmental (preflowering) period. In New World amphidiploid leaf types, and in wild diploids, *G. thurberi* and *G. anomalum,* development is normally arrested during phase B. In Asiatic cultivated types phases A and B are completed in early seedling stages and development continues in phase C.

A mathematical relationship was demonstrated between leaf growth and leaf development. The latter may be regarded as a recapitulation of the former—complete recapitulation in the case of entire-leaved types, modified recapitulation in lobed-leaved types. Allels which control this growth and developmental mechanism do so by varying the rate and extent of change in leaf pattern, and also by varying the timing of the pattern change initiation in relation to the general developmental processes of the plant.

Length, fineness, and strength of cotton lint as related to heredity and environment, N. I. HANCOCK. (Univ. Tenn.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 6, pp. 530–536*).—Measurements given on the properties of length, fineness, and strength of cotton lint were made on the fibrograph and arealometer (developed at the Tennessee Experiment Station) and Pressley fiber strength tester (Arizona Station). These lint properties are definitely genetic characters of the cotton plant, and varieties show significant differences in their expression. Environmental conditions of the area where a variety is grown are found to have an important influence upon expression of the three lint properties. While these lint properties may be considered independent genetically, under variable environments fineness follows length in a positive manner and strength follows length in a negative manner.

Geographical distribution of the genus Pyrus and trends and factors in its evolution, G. A. RUBTSOV (*Amer. Nat., 78 (1944), No. 777, pp. 358–366*).—This paper refers to the genus *Pyrus* as comprising the pear group proper. "In the

present epoch one of the most important factors in species- and form-genesis in *Pyrus* is hybridization," and particularly great is its role in the origin of the diversity of cultivated varieties. "For the radical improvement of the pear with respect to winter hardiness, disease resistance, and ecological adaptability pear breeders now have at their disposal a great diversity of initial material."

Anthocyanmutanten bei Lupinus angustifolius L. [Anthocyanin mutants in L. angustifolius], H.-J. Troll (*Züchter, 15 (1943), No. 4–6, pp. 73–78, illus. 7*).

Instability of the mating type alleles in Saccharomyces, C. C. and G. Lindegren (*Ann. Missouri Bot. Gard., 31 (1944), No. 2, pp. 203–217, illus. 5*).—Mating type allels in *S. cerevisiae* were found unstable, and cultures capable of copulation became transformed in the laboratory into Torulas incapable of mating with one another or with tester strains. The instability of the mating allels resulted in the selection of mutants of diminished fertility during the period that the isolated haplophase was grown in pure culture. Structures resembling copulation tubes were produced by exposure of yeasts to camphor, but nuclear fusions have not thus far been induced by mating cultures in its presence.

Albinism in cattle, W. E. Petersen, L. O. Gilmore, J. B. Fitch, and L. M. Winters. (Minn. Expt. Sta.). (*Jour. Hered., 35 (1944), No. 5, pp. 135–144, illus. 8*).—Albinism was inherited as a simple mendelian recessive in 43 matings involving albino and heterozygous albino matings and crosses of these with normal Holstein, Guernsey, and Ayrshire cattle. Ghost pattern was not present at birth but developed during the latter part of the first 6 mo. A hair structural abnormality seemed responsible for the ghost pattern rather than differences in pigmentation. The structure of the hair causes a greater absorption of light which is responsible for the darker areas in the lighter background. The ghost pattern is thought to be associated with the factor for black (*B*). It was shown that albinos may carry *B, bb, SS, ss, Lwlw,* and *Plpl* and the dominant modifier of the Ayrshire type of recessive white spotting that is found in Holsteins. Albinism is thought to be due to the lack of inheritance factors conditioning the presence of the enzyme tyrosinase. Microscopic study showed the white hairs to be smaller than those from the darker areas of the ghost pattern.

Genetics in the diagnosis of bovine congenital porphyrinuria (pink tooth), P. J. J. Fourie (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 18 (1943), No. 1–2, pp. 305–308*).—A Shorthorn bull showing skin lesions of photosensitization from calfhood and remotely related to a porphyrin-carrier bull sired two normal calves from two cows suffering from porphyrinuria.

Control of ovulation in the cow, J. Hammond, Jr., and P. Bhattacharya (*Jour. Agr. Sci. [England], 34 (1944), No. 1, pp. 1–15, illus. 3*).—Up to 30 ovulations were obtained in a series of cows and heifers injected with 1,500–5,000 International Units of gonadotropin of pregnancy urine or pregnant mare serum from 5 days before to 3 days after expression of the corpus luteum. Among the few treated cows allowed to calve, there were several twin and triplet births. Varying doses of the gonadotropin were administered intravenously and subcutaneously. The ovulation induced was investigated on slaughter a few days after the treatment.

The postnatal history and function of the interstitial cells of the testis of the bull, C. W. Hooker (*Amer. Jour. Anat., 74 (1944), No. 1, pp. 1–37, illus. 38*).—Histological study of the testes of 30 bulls from 1 mo. to 15 yr. of age, correlated with changes in the sexual behavior and the androgen content of the testes, gave evidence of Leydig cells differentiating from intertubular mesenchymal cells as the source of androgens. Nuclear changes involving the appearance of one or two large nucleoli and the dispersal peripherally of much chromatin was completed in some cells as early as 4 mo. of age. From 3½ mo. to 2 yr. there was a steady increase in the proportion of cells with Leydig cell nuclei and a granular cytoplasm.

After 2 yr. the Leydig cells became extensively vacuolated and greatly increased in number and size. From 5 to 15 yr. there was an increasing loss of vacuolation and diminution in the size of the Leydig cells. Stages of disintegration of the Leydig cells were noted in animals over 15 yr. of age. Changes in the androgen level in the testes ascertained in bird units by methods of T. F. Gallagher and F. C. Koch[1] fluctuated slightly above or below what appeared to be the mode for each age, but the trend was evident, reaching a maximum at about 5 yr., after which there was a regular decrease to 15 yr. Testis weight increased rapidly after 7½ mo., but rapid increases in the Leydig cells and androgen content of the testis did not occur until after 2 yr. Two distinct phases were apparent in the development of the Leydig cells—the first involving a metamorphosis of the mesenchymal cells into a granular polyhedral epithelioid cell; the second, the vacuolation of the granular cell. The first phase was complete in certain cases as early as 8 mo., but the second did not begin until 2 yr. of age.

The bacteriology of bull semen.—II, The effect of bacteria upon rapid tests for semen quality, I. C. Gunsalus, J. J. R. Campbell, G. H. Beck, and G. W. Salisbury. (Cornell Univ.). (*Jour. Dairy Sci., 27 (1944), No. 5, pp. 357–364*).—In continuation of this series (E. S. R., 86, p. 520), using semen samples from dairy bulls of the University herd or from bulls owned by the New York Artificial Breeders' Cooperative, the time required for reduction of 1 : 40,000 methylene blue by bull semen diluted at a constant rate with yolk-citrate diluent was ascertained (E. S. R., 90, p. 36). The results showed that when the semen is collected and handled with proper sanitary precautions and the diluent is so treated, the number of bacteria will not interfere with the estimates of quality ascertained by the methylene blue reduction test. The recommended temperature of 46.5° C. for conducting the test was high enough to prevent growth of the bacteria, especially in the presence of methylene blue. Of the bacteria found, the *coli-aerogenes* organisms were most likely to interfere with the test, but they were largely eliminated by sanitary care. *Pseudomonas* organisms were sometimes found in large numbers and were harder to control. Bulls harboring these organisms were poor risks for artificial insemination. The short-time high-temperature incubation test is recommended as a criterion for the potency of stored semen samples.

The effects of diethyl-stilboestrol and pregnant mare serum on the oestrous cycle of Merino ewes, J. I. Quin and J. G. van der Wath (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 18 (1943), No. 1–2, pp. 139–147*).—In order to ascertain the effect of stilbestrol on Merino ewes, 43 anestrous ewes were injected with doses ranging from 1 to 5 mg. per head. Of these, 8 came to full estrus in about 48 hr. and another 8 displayed poor and doubtful signs of heat. In a further experiment, doses of 1 mg. or less of stilbestrol induced estrus in spayed ewes. Evidently the complete removal of ovarian tissue provided a definite increase in sensitivity. These results were corroborated by the action of the gonadotropic hormone of pr gnant mare serum.

Behaviour of some external characteristics in Essex pigs, T. M. Olbrycht (*Jour. Agr. Sci. [England], 34 (1944), No. 1, pp. 61–21, illus. 3*).—The variations in the color and markings of the pigs of 78 Essex litters showed that 53.4 percent of the individuals were correctly marked, i. e., black with white belt encircling the shoulders and forelegs, with white on the nose, tip of tail, and hind feet. Variations from correct markings were described, including especially belt without white nose and tail tip and all black, each of which occurred in about 10 percent of the cases. Other cases occurred in smaller proportions. There were no indications of differences in genetic factors for color in Wessex and Essex breeds as the result of crosses of boars of the former with sows of the latter.

[1] Jour. Pharmacol. and Expt. Ther., 40 (1930), No. 3, pp. 327–339, illus. 5.

Inheritance and histology of wattles in swine, E. Roberts and C. C. Morrill. (Univ. Ill.). (*Jour. Hered., 35 (1944), No. 5, pp. 149–151, illus. 2*).—Wattles in swine appear to be due to a single dominant gene. Among 84 pigs produced by 9 normal sows mated to a wattle boar, there were 65 living of which 29 had wattles. It was assumed that the boar was heterozygous (*Ww*). The wattles are teatlike appendages with a cartilaginous core closely invested by dense, fibrous connective tissue, between which are spaces filled with adipose tissue. Histologically, the wattles of goats were shown to be similar to those in swine.

Gonad hormones and sex differentiation, C. R. Moore (*Amer. Nat., 78 (1944), No. 775, pp. 97–130*).—By an analysis of the literature an attempt was made to show the role of sex hormones in sexual differentiation of species of birds and mammals. Sex hormones are limited to the secretions of a steroid nature from the gonads, and thus would not include such substances as are produced by the adrenal pituitary or from other sources which might influence sex characters. The action of inductor and inhibitor substances is discussed. The application of chemical androgens and estrogens has induced many modifications during development in the character of gonadal differentiation and the differentiation of sex ducts and other accessory sex characters. "The available evidence suggests that in the bird sex hormone secretion begins only after hatching, in the rat from birth up to the tenth day, in the guinea pig perhaps slightly later, in the opossum not until an age subsequent to the one-hundredth day of postnatal life." It is not suggested that the freemartin case can be explained on this basis. There exists a high degree of similarity between characters in the parabiotic twins and freemartins, but the conditions found in parabiotic urodeles and in the duct system in the freemartin were not duplicated. An extensive bibliography is included.

Effects of adrenocorticotropic hormone (ACTH) on the osseous system in normal rats, H. Becks, M. E. Simpson, C. H. Li, and H. M. Evans (*Endocrinology, 34 (1944), No. 5, pp. 305–310, illus. 7*).—Twelve male rats 26 days of age, injected intraperitoneally three times daily with a total dose of 1 mg. of adrenocorticotropic hormone daily for 30 days, gained an average of 80 gm. as contrasted with 154 gm. by a like number of normal controls. Chondrogenesis and osteogenesis in the region of the proximal epiphysis of the tibia were also retarded. Restriction in food resulted in body growth which was somewhat less marked than that following ACTH administration. In the absence of the adrenals, growth inhibition and bone changes were not caused by ACTH.

Antagonism of pituitary adrenocorticotropic hormone (ACTH) to the action of growth hormone on the osseous system of hypophysectomized rats, H. Becks, M. E. Simpson, W. Marx, C. H. Li, and H. M. Evans (*Endocrinology, 34 (1944), No. 5, pp. 311–316, illus. 8*).—"As a result of simultaneous administration of ACTH and growth hormone, the following changes in the typical effects of growth hormone were observed [in 29-day-old hypophysectomized female rats]: (1) The proximal epiphyseal cartilage of the tibia was greatly decreased in width. (2) Endochondral bone formation was significantly retarded. (3) Osteoblastic as well as osteoclastic activity was greatly decreased, perhaps accounting for the irregular arrangement of bony trabeculae. (4) The cartilage columns in the erosion zone were also more irregular."

Genetics of body size and related characters.—II, Satellite characters associated with body size in mice, J. W. MacArthur (*Amer. Nat., 78 (1944), No. 776, pp. 224–237*).—"Small and large races of mice, produced from one stock by eight generations of selection for body size alone, came to differ strikingly and significantly, not only in body size but unexpectedly in many other characters and traits as well (behavior, hair colors, relative length of the appendages, and litter size). The large race, for instance, has certain distinguishing coat colors (brown, dilute,

etc.); is more docile and inactive; has comparatively shorter ears, feet, and tail; and bears many more young in a litter. The coat colors are such as are controlled by genes, either known to exert pleiotropic growth-accelerating effects or probably fixed by chance drift. Behavior differences may be associated with metabolic levels. Appendages are proportionately small because they grow less rapidly than the body in the last stages of growth. Large litters are due to superovulation in the large race, evidently regulated by the gonadotropic hormone of the anterior pituitary. Litter size and length of appendages appear to be dependent, like satellites, upon body size as the central and dominating member of a complex of correlated characters, with a common development basis in growth. Differences between the mouse races in litter size or length of appendages are determined, not by special fertility factors or ear-length genes, etc., but, in great part at least, by the same common and general multiple size or growth rate factors that control body size."

Genetics of body size and related characters.—I, Selecting small and large races of the laboratory mouse, J. W. MACARTHUR (*Amer. Nat., 78 (1944), No. 775, pp. 142–157, illus. 2*).—From a large population resulting from the hybridization of several laboratory strains of mice, there were developed from one segregation a race of small body size and an exceptionally large race averaging one-fourth larger than the small race at birth and twice as large as the small race at 60 days of age. The size distribution of the two races showed little overlapping. Through selection, less grams were lost by minus selection than were gained by an equal effort in plus selection. Less grams were gained or lost by females than by males, but sex differences were not apparent on a logarithmic or percentage scale. "These data agree with the view that size genes or modifiers multiply each other's effects (that is, act geometrically), and do not simply add to or subtract from the body weight some definite and constant number of grams."

Transplantation as a tool of developmental genetics, W. LANDAUER. (Univ. Conn.). (*Amer. Nat., 78 (1944), No. 776, pp. 280–284*).—The transplantation experiments on the eye of creeper fowls are interpreted on the assumptions that "(1) a substance x is normally elaborated by all embryonic tissues and cells or by certain types of cells occurring throughout all tissues; (2) the elaboration of substance x is hindered by abnormalities in the supply of oxygen or certain nutrients; (3) substance x is needed for cell multiplication and/or certain steps of differentiation; (4) substance x can, if necessary, be taken up by cells from the blood or from neighboring tissues; (5) the rate of production of substance x is reduced in the presence of the creeper mutation." In the genetic analysis of developmental tracts, transplantation experiments may be subject to several interpretations.

Egg shell color in crosses between white- and brown-egg breeds, G. O. HALL. (Cornell Univ.). (*Poultry Sci., 23 (1944), No. 4, pp. 259–265, illus. 3*).—The color intensities of the eggs of F_1 pullets from reciprocal crosses of Rhode Island Reds and White Leghorns were intermediate between the eggshell color intensities of the parents, which was explained on the basis of multiple factors. Seasonal variation in the intensity of eggshell color was exhibited in both the F_1 pullet and the Rhode Island Red eggs. The intensity of pigmentation decreased from the time laying started in the fall until early summer, after which there was a slight increase until the end of the laying year. If sex-linked genes were involved in the inheritance of eggshell color, the greater influence of the male than the female on eggshell color of the F_1 progeny, as observed in this study and in the findings of others, would be explained. The Ridgway color standards of 448 eggs from Rhode Island Red male × White Leghorn female crossbreds averaged 2.44, but 1.71 in 852 eggs hatched in 1938 from White Leghorn male × Rhode Island Red female crossbreds. Eggs from crossbred pullets in 1939 were also more heavily

pigmented from Rhode Island Red males than from White Leghorn males, averaging 1.83 among 673 eggs and 1.69 among 931 eggs, respectively. The seasonal changes in shell color were noted in the eggs of the crossbreds and in 590 eggs from Rhode Island Red pullets.

The influence of age on expression of genes controlling rate of chick feathering, M. I. Darrow and D. C. Warren. (Kans. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 3, pp. 199–212, illus. 2*).—Continuing studies by Serebrovsky (E. S. R., 48, p. 565) of feathering at different ages, correlations were calculated between arbitrary measures of wing feathering in day-old chicks, tail feathering at 10 days of age, and back feathering at 6 or 8 weeks of approximately 5,000 purebred grade and crossbred chicks of the Barred Plymouth Rock, Rhode Island Red, White Plymouth Rock, and White Leghorn breeds. Variations in time of hatching were found, in groups of 115 males and 123 females examined at the twenty-first day of incubation and again 20–24 hr. later, to have only slight effect on number of flight feathers, but the length of feathers was significantly influenced in the day-old descriptions. The tail scores at 10 days were highly correlated with the back feathering at 6 and 8 weeks of age. These were calculated separately for male and female chicks of each breed. The highest correlations in the study were between 10-day tail scores and 6- and 8-week back scores, being 0.517 for all males and 0.527 for all females. The development of the tail at 10 days of age proved a valuable characteristic for predicting broiler feathering in chicks carrying the sex-linked early-feathering gene. Highly significant coefficients of correlation were obtained between the number of well-developed secondaries and both the 10-day tail scores and the 6- and 8-week back-feather scores. The low correlation of White Rocks is explained as due to low variability with the high mean for broiler feathering. In 954 males and 1,133 females, coefficients of correlation of 0.429 and 0.478, respectively, were found between the number of secondaries at 1-day and 10-day tail scores, and 0.416 and 0.381 between the number of secondaries and 6-week back feathering. The number of primaries did not afford a satisfactory basis for predicting the back-broiler feathering. The mean length of the secondaries at hatching for the males was 10.2 mm. and for the females 10.4 mm. The correlation values for 10-day tail feathering score in males was 0.343 and for females 0.436 between secondary feather lengths and 10-day tail scores. Significant but smaller correlations were found between the length of secondaries and the broiler feathering. The mean lengths of the primaries in birds homozygous for early feathering at 1 day of age were 14.4 mm. for males and 14.5 mm. for females, with correlations of 0.207 for males and 0.321 for females with the 10-day tail score. Correlations with back score were smaller, and therefore the lengths of primary mean feathers in day-old chicks would be unreliable as a basis for predicting broiler feathering. In studies of the genetic nature of variations in feathering, it appeared that the degree of feathering of the tail at 10 days and broiler feathering of heavy breeds with the early feathering factor was modified by the action of an autosomal recessive gene which acted on early feathering and caused an intermediate type. This seemed similar to retarded feathering, described by Warren (E. S. R., 72, p. 172). Several matings of intermediate males with early and late Leghorn females produced offspring which suggested that intermediate is controlled by a simple autosomal dominant modifier expressing itself better in males heterozygous for late feathering than in the homozygotes.

Effect of oxygen concentration on the development of the chick embryo, S. R. Cruz and A. L. Romanoff. ([N. Y.] Cornell Expt. Sta.). (*Physiol. Zool., 17 (1944), No. 2, pp. 184–187, illus. 1*).—About 800 fertile eggs were exposed to oxygen concentrations from 11 to 95 percent in desiccators. The chick embryo can survive after an oxygen concentration of 11 percent for 5 days, and some

hatched when this was followed by incubation under normal conditions. As much as 75 percent of oxygen was tolerated for 5 days, but mortality was high, and very high with greater concentrations of oxygen. The greatest early growth of embryos was obtained with 41 percent of oxygen for 5 days. The highest hatchability was shown when the initial oxygen content was about 32 percent.

An experimental analysis of barred pattern formation in feathers, M. NICKERSON (*Jour. Expt. Zool., 95 (1944), No. 3, pp. 361–397, illus. 28*).—Study was made of the roles and mode of action of the melanophores and epidermal substratum of the feather germ of the Silver Campine and Barred Plymouth Rock in the production of the barred pattern. The mean rhythmic periods of the patterns of feathers from the various tracts were found to average from 2.48 to 4.43 days for the Silver Campine and 5.16 to 6.09 days for the Barred Rock. In grafted White Leghorns, barred patterns of the donor were always produced according to expectation, indicating that the barring rhythm is determined by the melanophores themselves through the medium of some diffusable substance which inhibits the formation of pigment by the malanophores present. Thus the phase of bar formation in a feather germ at any given time was dependent upon the length of time since the beginning of pigment deposition in that feather rather than its total age. The effects of various conditions on the appearance of barring were found to agree with expected results on the basis of the diffusion mechanism of barred-pattern control. An increase in the growth rate led to a proportional increase in the black area and to a decrease in the clarity of the pattern. Regions with larger barbule ridges tended to have a more clear-cut pattern and a larger percentage of white. The barred pattern was absent in lightly pigmented feathers, but reappeared with increased intensity of pigmentation.

Breeding can lengthen the life of your flock, C. H. BOSTIAN and R. S. DEARSTYNE (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 2, pp. 4–6, 12, illus. 3*).—By selection of breeders from progeny and sib testing, it was possible to improve the livability so that after 3 yr. the mortality was only half as great from selected as from unselected matings. Among 511 pullets from the selected stock in 1941–42, there was a livability of 89 percent as contrasted with 72 percent among 114 pullets from unselected stock. The pullets showed no relation of mortality to sex maturity under 240 days, but mortality was higher for pullets weighing less than the average. The best livability came from crosses with low or no inbreeding. Pedigree breeding from trapnested stock, without culling, accompanied by a great deal of record taking is recommended, so that selection of breeding stock may be based on the performance of the entire family.

Effect of thiouracil and thiourea on the thyroid gland of the chick, J. P. MIXNER, E. P. REINEKE, and C. W. TURNER, (Mo. Expt. Sta.). (*Endocrinology, 34 (1944), No. 3, pp. 168–174, illus. 3*).—Groups of 14–27 1–2-day-old chicks of 9 breeds were fed for 14 days with 0.025, 0.05, 0.1, and 0.2 percent of thiouracil or thiourea, then killed and their thyroids dissected. There was progressive thyroid enlargement with the use of thiourea and thiouracil, the maximum responses being secured with both drugs at the 0.1-percent level. The thyroid weights per 100 gm. of body weight were greater for females than for males at all dose levels with both drugs. The thyroids of the chickens of the lighter breeds gave greater response than those of the heavier breeds.

Effect of feeding thyroactive iodocasein to Barred Rock cockerels, C. W. TURNER, M. R. IRWIN, and E. P. REINEKE. (Mo. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 3, pp. 242–246*).—The growth of Barred Plymouth Rock cockerels to 12 weeks on a basal ration exceeded the growth when receiving 0.1 percent of Protamone (thyroactive iodocasein) (E. S. R., 90, p. 35) for 6, 8, 10, or 12 weeks. When the groups were taken off Protamone at these periods and received a basal

ration only, the growth rate appeared to momentarily decline as contrasted with controls. The carcasses of those receiving Protamone throughout the 12 weeks contained little subcutaneous fat. About 4 weeks were required to restore the subcutaneous fat after Protamone feeding ceased, but 2 weeks was sufficient time to obtain a return of the carcass fat. The Protamone feeding caused a stimulation of feather growth by the fourth week, but depressed growth of the thyroid glands and they were rather difficult to dissect out. The studies were conducted in 5 groups of about 20 birds each.

Oral administration of estrogens in poultry, R. G. Jaap and R. H. Thayer. (Okla. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 3, pp. 249–251*).—In experiments on the effects of orally administered estrogens, the dimethyl ether of diethylstilbestrol was the most potent and should be the most suitable for fattening. Treatment for 16 days with 20 mg. increased the weight from 36 to 112 gm. Study was made of the effect of various doses of stilbestrol, ethinyl estradiol, methyl ether, and propionate of stilbestrol on fattening after treatments of from 10 to 28 days.

Effect of light upon time of oviposition in ringdoves, J. P. Schooley and O. Riddle (*Physiol. Zool., 17 (1944), No. 2, pp. 187–193, illus. 1*).—The time of laying 1,604 eggs by ringdoves between November 18 and June 23 showed that the first egg of a clutch of two was laid progressively later in the afternoon as the days were getting longer and that the second egg was laid progressively earlier on the morning of the second day. Cloudy weather seemed to affect the time of oviposition. On cloudy days the time of laying the first egg was about 30 min. earlier, and the second egg was about 45 min. later. Attempts to relate time of laying to other variables than light intensity were unsuccessful. Birds confined to cages with restricted lighting were unable to expel eggs, but the condition was largely corrected by daily ultraviolet radiation of such birds over a 2–4 week period.

The correlation between antigenic composition and geographic range in the Old or New World of some species of Columba, R. W. Cumley and M. R. Irwin. (Univ. Wis.). (*Amer. Nat., 78 (1944), No. 776, pp. 238–256, illus. 1*).—The antigenic interrelationships of the blood cells of 11 species of the genus Columba were shown to furnish a basis for Old World and New World species. The data indicate that "the antigens of each species of either the Old or New World are more like those of any other species of that hemisphere than they are like those of any single species of the other." The cellular antigens of a species are many and are gene-determined. A separation seems to have taken place early in the evolutionary history of the ancestral stock of each hemisphere. In this way the Old World species were *guinea, janthina, livia, oenas,* and *palumbus,* and the New World species, *fasciata, flavirostris, leucocephala, maculosa, picazuro,* and *rufina.*

Further studies on the survival of spermatozoa in the female reproductive tract of the bat, W. A. Wimsatt. (Cornell Univ.). (*Anat. Rec., 88 (1944), No. 2, pp. 193–204*).—Carrying further studies of survival of spermatozoa in the winter in the uteri of dormant bats (E. S. R., 88, p. 324), highly motile sperm were found in the genital tract of females autopsied during hibernation. The presence of normal embryos was observed in females kept at room temperatures for a time following hibernation but isolated from males, in two cases for 138 and 156 days. Thus the stored spermatozoa must retain their ability to fertilize ova when released.

FIELD CROPS

The prairie and associated vegetation of southwestern Alberta, E. H. Moss (*Canad. Jour. Res., 22 (1944), No. 1, Sect. C, pp. 11–31, illus. 11*).—Major grassland types recognized and correlated with climatic factors, topography, and soil color zones are the *Bouteloua-Stipa* association in the dark-brown soil zone, *Festuca-*

Danthonia association in the black soil zone, and *Agropyron-Stipa-Carex* associes in the intermediate shallow black soil zone. About 125 of some 250 species and varieties of vascular plants found in these grassland communities are regarded as either common or characteristic. Poplar and coniferous vegetation is considered in relation to climate, physical features, and associated grassland, and prairie and poplar associations are compared with corresponding vegetational types described for other regions.

Grasses of Brazil and Venezuela, A. CHASE (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 7, pp. 123–126, illus. 5*).—A popular account of the grasses, their distribution, and values for pasture, erosion control, and other uses.

Grasses and clovers in New Zealand (*New Zeal. Dept. Agr. Bul. 210 [1944], pp. 78+, illus. 86*).—Grasses well known or of economic importance in New Zealand, described with remarks on habitat, value for pasture or other uses, and management, are grouped as thriving on margins of lakes, swamps, and lagoons, under saline conditions, on country poorly drained or with a high water table, and grasses thriving on country of high fertility, well drained and supplied with moisture. Legumes are described as perennial and annual clovers and allied plants.

Seed production of several southern grasses as influenced by burning and fertilization, G. W. BURTON. (U. S. D. A. and Ga. Coastal Plain and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 6, pp. 523–529, illus. 1*).—Burning old sods (1942-43) greatly increased seed yields of Bahia grass (*Paspalum notatum*) and Bermuda grass but had no effect upon seed yields of ribbed paspalum (*P. malacophyllum*) and reduced those of carpet grass (*Axonopus affinis*). In Paraguay Bahia grass, burning increased the head abundance, decreased panicle size, seed weight, and vegetative growth, and had no influence upon percentage of florets to set seed. In general, January, February, March, and April burnings were equally effective in stimulating seed production in Bahia grass, although seed yields of early-maturing strains, as Pensacola Bahia, may be reduced by April burning. Burning increased seed yields in nine different strains of Bahia grass. Sodium nitrate applied 500 lb. per acre and 1 ton of 4–8–4 fertilizer were equally effective in increasing yields of seed and above-ground parts in Paraguay Bahia.

The effects of fertilization, species competition, and cutting treatments on the behavior of Dallis grass, Paspalum dilatatum Poir., and carpet grass, Axonopus affinis Chase, R. L. LOVVORN. (N. C. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 590–600, illus. 9*).—Behavior of Dallis grass and carpet grass in pure stands and in combinations with legumes was studied under six soil fertility levels on Norfolk (well-drained) and on Lynchburg (poorly drained) fine sandy loam. The two grasses were also grown in pure stands in the greenhouse at two fertility levels and four frequencies of defoliation. Dallis grass was more productive than carpet grass but was more sensitive to defoliation, its yields being inversely related to frequence of defoliation. The extent to which Dallis grass could compete with carpet grass in permanent pasture was affected by available nutrients, presence of legumes, and cutting frequency. Response to N was greater for Dallis grass than for carpet grass, but grass-clover combinations responded little to commercial N after legumes were established. Legumes in combination with the grasses were essential for satisfactory yields. Dallis grass in mixture with low hop clover outyielded other seeding combinations during April and May.

Relative palatabilities of grasses under cultivation on the northern Great Plains, G. A. ROGLER. (U. S. D. A. and N. Dak. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 6, pp. 487–496*).—When species and strains of grasses in plats and rows at Mandan, N. Dak., were accessible, 1938–43, to yearling Hereford steers, bromegrass ranked highest among 10 cool-season species in plats in palatability on a seasonal basis and reed canary lowest. Russian wild-rye was low in palati-

bility in the early season but was preferred later. Fairway crested wheatgrass was much less palatable than strains of Standard crested wheatgrass under early grazing. Mature crested wheatgrass was low in palatability and did not rate above reed canary. Of 8 warm-season species in rows, big bluestem ranked highest and buffalo grass lowest on a seasonal basis. Little bluestem was palatable in the early season but was avoided when it became mature.

Revegetation in the tall grass prairie region, D. R. Cornelius. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 393–400, illus. 2*).—A mixture of native grasses, including big bluestem, little bluestem, side-oats grama, switchgrass, Indian grass, and tall dropseed, was planted, 1940–42, near Manhattan, Kans., on upland retired from cultivation. Better establishment of grass seedlings was obtained in 2 of 3 yr. by planting on land in oats the previous year. The land was plowed in July and a firm seedbed prepared at grass-seed planting time in late April of the next spring. Sudan stubble and millet stubble grown the previous year and left unplowed were fairly satisfactory, while sweetclover stubble was the least satisfactory of the stubble mulches tested. Side-oats grama, Indian grass, switchgrass, and big bluestem were established better in relation to viable seed planted than little bluestem or tall dropseed. Weed competition, especially crabgrass, was severe throughout the seedling year but was reduced enough by two clippings to permit grass seedlings to survive the first year. Perennial grasses could compete effectively with weeds in the second year when only one clipping was needed. Compared with natural revegetation, about the same basal cover might be obtained the second year after establishment by seeding, and with a much better choice of species, as in 20 yr. of natural revegetation on abandoned land.

Emergency in grass, O. Arnold (*Amer. Forests, 50 (1944), No. 6, pp. 280–283, illus. 5*).—A popular account of the merits of controlled grazing of range.

Crop calendars for a year-round pasture program, H. W. Staten (*Oklahoma Sta. Cir. 116 (1944), pp. 15, illus. 4*).—Native pastures in Oklahoma do not furnish green grazing longer than 5 or 6 mo. each year, and much dry feed is needed by livestock unless supplemental pasture is provided. Pasture schedules or calendars considered appropriate for western, central, and eastern Oklahoma suggest crop combinations—involving rotation pastures, native and/or tame grasses, and legumes—to meet regional needs. Pasture schedules of this type require careful planning and management.

Increasing feed value of pastures, J. O. Halverson and F. W. Sherwood (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 1, pp. 7–8*).—Addition of limestone and phosphates to upland pasture on Halewood loam, an important mountain soil, resulted in increased acre yields of dry matter and yields and percentages (in herbage) of protein, Ca, and P.

The importance of borax in legume seed production in the South, J. R. Piland, C. F. Ireland, and H. M. Reisenauer. (N. C. Expt. Sta.). (*Soil Sci., 57 (1944), No. 1, pp. 75–84, illus. 2*).—Seed yields for alfalfa (E. S. R., 89, p. 54), crimson clover, and hairy vetch were increased by borax applications on soils low in available B. Borax, 5 lb. per acre, improved grade quality of peanuts; and 20 lb. per acre broadcast previous to planting caused injury to soybeans, with a reduction in stand and height, but gave a highly significant increase in pods per plant, with no difference in yield. Constant differences were noted in the germination quality of seed of alfalfa, crimson clover, and soybeans produced at several B levels. Available B contents of Coastal Plain, Piedmont, and Mountain soils of North Carolina appeared to be too low for the most economic production of legume hays or seeds. Average available B in topsoils of each of these regions was 0.24, 0.27, and 0.35 p. p. m., respectively.

Oil seeds in western Canadian grain screenings, J. A. Anderson, W. O. S. Meredith, W. J. Eva, and A. C. Heise (*Canad. Jour. Res., 22 (1944), No. 1, Sect. F, pp. 19–27*).—Refuse screenings (190 carlots) from cereal grains, shipped from Fort William and Port Arthur, Ont., in the second quarter of the 1942–43 crop year, contained an average of 49 percent of weed seeds, having an oil content of 14.6 percent. The principal oil-bearing seeds were wild mustard, 8.8 percent; stinkweed, 2.9; broken flax, 2.4; hares-ear-mustard, 1.6; and tumbling mustard, 0.9 percent. Amounts of total seeds and of individual species varied widely in different shipments. Refuse screenings from flax (56 carlots) averaged 75 percent of weed seeds and other small heavy material, having an oil content of 21.4 percent. The principal oil-bearing materials were broken flax, 13.8 percent; wild mustard, 11.7; stinkweed, 9.4; hares-ear-mustard, 5.0; and tumbling mustard, 2.8 percent.

Hygroscopic equilibrium of sunflowerseed, flaxseed, and soybeans, R. K. Larmour, H. R. Sallans, and B. M. Craig (*Canad. Jour. Res., 22 (1944), No. 1, Sect. F, pp. 1–8, illus. 3*).—Equilibrium moisture values for relative humidities of from 31 to 93 percent were obtained for sunflower seed, flaxseed, and soybeans. Hygroscopicity of whole sunflower seed per se is practically the same as that of flaxseed, while that of dehulled sunflower seed is somewhat lower. Soybeans showed a hygroscopicity curve quite different from that of flax and sunflower seed. Differences in curves were not explainable by the oil or ash contents of the seeds.

Respiration of whole and dehulled sunflowerseed and of flaxseed, R. K. Larmour, H. R. Sallans, and B. M. Craig (*Canad. Jour. Res., 22 (1944), No. 1, Sect. F, pp. 9–18, illus. 4*).—Effects of various moisture contents on CO_2 production of whole and dehulled Mennonite sunflower seed (E. S. R., 89, p. 664) and of Bison flax seed were studied. The safe moisture limit for straight grading of whole, undamaged sunflower seed intended for bulk storage was estimated to be 9.5 percent, while for dehulled sunflower seed it appeared that 6 percent moisture must be regarded as maximum for safe storage.

Plantas huliferas: El guayule y la Cryptostegia grandiflora [Rubber plants: Guayule and C. grandiflora], M. Martinez (*México: Ediciones Botas, 1943, pp. 110+, illus. 12*).—A general account on these two rubber-producing plants and their product, with bibliographies.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 7, pp. 7–8*).—Progress results of agronomic research are reported in articles entitled Early Oats-Vetch Yield Well After Grazing in Winter, by W. C. Cowsert (p. 7); Cotton Fertilizer Plus Legumes on Loam Soil of Delta, by J. Pitner (p. 7); and Planting Methods for Vetch, Black Land—Preliminary, by R. Woodburn and N. L. Palmer (p. 8).

Some notes on technique in barley breeding, M. N. Pope. (U. S. D. A.). (*Jour. Hered., 35 (1944), No. 4, pp. 98–111, illus. 10*).—Useful procedures and technics in growing the crop, emasculation, and pollination are described from experiences gained in 35 yr. of research with barley.

Two decades of buffalo grass harvesting, D. R. Cornelius. [U. S. D. A.]. (*Seed World, 55 (1944), No. 8, pp. 10–12, illus. 2*).—A historical account of the development of equipment for harvesting buffalo grass seed.

Chromosome knobs in relation to the origin of maize, R. G. Reeves. (Tex. Expt. Sta.). (*Genetics, 29 (1944), No. 2, pp. 141–147, illus. 1*).—Numbers of knobs on chromosomes of corn, noted by Longley (E. S. R., 79, p. 315), were determined for representative regions of North, Central, and South America, and the results analyzed to determine possible relationship between number of knobs and (1) proximity to Central America, and (2) distance from the Andean region of South America. The first relationship is statistically significant. In spite of the statistical insignificance of the second relationship, these results are held explainable on the hypothesis of the origin of corn and teosinte as given in following paragraph.

"Maize was first developed as a highly domesticated plant in the Andean region and was spread from there more or less concentrically until it reached practically all parts of South, Central, and North America. Its chromosomes were knobless. However, during its migration northward it became hybridized with a knobby-chromosome relative, *Tripsacum,* in Central America, and from the hybrids new types of knobby-chromosome maize were derived. These new types then began to spread in every possible direction. Their dissemination through South America was retarded, particularly in the Andean region, by their coming in competition with the original, well-established Andean types; but in spite of this competition they became established to some extent in certain South American countries. In North America, on the other hand, the new types met with less competition and became more abundant than the original Andean types." Consult also an earlier note by Mangelsdorf and Reeves (E. S. R., 82, p. 177).

Official variety tests in North Carolina: Corn hybrids, R. P. Moore and L. S. Bennett (*North Carolina Sta. Agr. Inform. Cir. 134 (1944), pp. 16*).—Performance data for 1943 and averages 1942–43 are tabulated for corn hybrids and open-pollinated varieties in official tests in six sections of the State.

Depth and method of soil preparation and cultivation for corn and cotton, C. A. Mooers (*Tennessee Sta. Bul. 191 (1944), pp. 11+*).—For corn, plowing 6 in. deep resulted in nearly maximum yields in all experiments, but neither subsoiling nor plowing 9–10 in. deep with a disk plow was profitable. On the more granular soils, characteristic of east and middle Tennessee, no cultivation with weeds controlled by hoeing resulted in unsurpassed yields, while no typical silt loam of west Tennessee, definite decreases in yield followed no cultivation. Yields on all soils were not influenced by the cultivation method, except where there was no cultivation.

Cotton under level culture produced as large crops where land was plowed 3 in. deep as with 6-in. plowing on both poor and rich Lintonia loam in west Tennessee. Where land was bedded but not flat-broken, the yields were favorable to 6-in. bedding. Plowing preparatory to bedding was profitable on rich land but distinctly unprofitable on poor land. Early plowing was notably superior under level planting, and early plowing and early bedding gave appreciably better yields at both 3- and 6-in. preparation depths. Good cultivation on poor land resulted in yields averaging nearly 30 percent larger than were obtained under no cultivation, while on rich land yields averaged the same from both practices.

Seed and hay yields of cowpeas, L. Ligon. (Okla. Expt. Sta.). (*Seed World, 55 (1944), No. 12, p. 50*).—Cowpea varieties outstanding in seed and hay yields in tests over 15 yr. included Chinese Red, New Era, Groit, and Whippoorwill. Relative resistance to bacterial canker and wilt is indicated.

Guayule: A list of references, A. J. Blanchard, rev. by A. Avakian and R. W. Moats (*U. S. Dept. Agr., Libr. List 10 (1944), pp. 61*).—A total of 438 annotated references to published items on guayule (*Parthenium argentatum*) are listed, together with a list of 34 patents on guayule and other rubber-bearing plants, and an index.

Inhibition of growth in guayule as affected by topping and defoliation, P. F. Smith. (U. S. D. A.). (*Amer. Jour. Bot., 31 (1944), No. 6, pp. 328-336, illus. 9*). —Effects of topping and defoliation of transplanted guayule (*Parthenium argentatum*) were studied at Salinas, Calif. Untopped or undefoliated plants showed strong retardation of new growth upon transplantation. There was evidence that leaves may inhibit axillary bud development on plants with undisturbed root systems. The sources of inhibition apparent were mature leaves, terminal buds, and stem from which terminal buds and leaves had been removed. A single adult leaf per branch sufficed to inhibit new growth of stems and roots. With transplants, regeneration

of new growth usually was slower when terminal buds were present (old leaves removed) than when they were removed. Bare stems of freshly decapitated plants caused temporary inhibition; growth was resumed within a few days, indicating that the residual agent was inactivated or consumed. The leaf inhibitor showed polar movement and was dependent on light for formation. Storage for 2 mo. at 30° F. had no appreciable effect on subsequent inhibitional responses. Various types of guayule nursery stock made more rapid recovery after transplanting, under spring and summer conditions, if pruned to remove three-quarters of the top (by height), which removed the terminal buds and usually all leaves. Topping apparently was instrumental chiefly in removing inhibiting organs. Plants developing after severe pruning did not differ in shape from those grown unpruned. Greatest uniformity of size occurred with the ¾-topped plants, which attained larger size as a result of the longer growth period gained by early starting.

Vicland oats increase yields, H. L. Shands and B. D. Leith. (Wis. Expt. Sta.). (*Seed World, 55 (1944), No. 12, pp. 16B, 48B, illus. 2*).—A popular account of the merits of Vicland oats (E. S. R., 91, p. 30).

Report on peanut experiments involving variety-fertility combinations conducted in 1943, G. K. Middleton, E. F. Schultz, Jr., W. E. Colwell, and N. C. Brady. (*North Carolina Sta. Agron. Inform. Cir. 135 (1944), pp. 4+*).—Growers in the new peanut belt, on the basis of variety-fertilizer tests reported, are advised to try Virginia Bunch instead of the small White Spanish peanut. Top dressing plants with KCl 75 lb. at emergence and applying at least 400 lb. per acre of gypsum to the foliage at time of blooming is recommended. On unfertile soils low in calcium, Virginia Bunch should not be grown unless gypsum is added. Growers planting Spanish should apply dolomitic lime 400 lb. in the row and KCl 75 lb. at emergence.

Potato collecting expeditions in Mexico and South America, [I], II, J. G. Hawkes (*Cambridge, Eng.: Imp. Bur. Plant Breeding and Genet., 1941, pp. 30, illus. 7; 1944, pp. 142, illus. 104*).—Expeditions to Mexico in 1938 and to South America in 1939 provided information noted in part 1 on distribution and primitive culture of the potato, and material for systematic and cytological study and also for breeding for cold and drought endurance and resistance to diseases, yield, and culinary quality.

Concerned primarily with classification and naming of specimens obtained in the expeditions mentioned above, part 2, Systematic Classification of the Collections, includes a short historical survey of potato taxonomy, review of botanical classifications, an account of the taxonomy and of cytological studies of the numerous specimens collected, and discussion of theories on the origin and evolution of cultivated potatoes and the origin of the European potato. Latin descriptions and a complete list with chromosome numbers of the new species and varieties and a complete list of identifications of the Empire Potato Collection are appended.

Soil fertility experiments with potatoes, B. A. Brown. ([Conn.] Storrs Expt. Sta.) (*Amer. Potato Jour., 21 (1944), No. 6, pp. 163-169*).—Potatoes yielded about the same after each of 10 green manure systems on Merrimac fine sandy loam, although in some years vine growth and yields were appreciably better during the first season after the green manures than during the second. Evidently it is most important to rotate potatoes with another crop. Under continuous culture, 1938–43, maximum yields were obtained from N 100 lb., phosphoric acid 80 lb., and potash 120 lb. per acre. Adding carriers of Ca, Mg, Na, Mn, Zn, B, and Cl to fertilizer containing only N, P, and K did not increase yields. See also an account of work on Charlton fine sandy loam (E. S. R., 79, p. 325).

Yield performance, baking qualities, and seed-source studies of certain potato varieties in Delaware, E. P. Brasher (*Delaware Sta. Cir. 15 (1944), pp. 8, illus. 1*).—Irish Cobbler was the best of the early-maturing potatoes in tests 1941–43, and

should be planted before April 15. Of the three outstanding late-maturing varieties, Sequoia and Pontiac performed well when planted either early or late but Houma did better when planted early. Sebago, Katahdin, and Chippewa, other varieties yielding well under certain conditions, did better in early plantings. Dakota Red has yielded too low for commercial planting but is excellent for home use since it keeps well in common storage. Sebago, Katahdin, Dakota Red, Chippewa, and Green Mountain led varieties tested for baking qualities. Northern-grown certified seed potatoes were found far superior to home-grown seed. When home-grown potatoes are used for the late planting they should be placed in cold storage from April 1 until 1 week before planting.

Cultural and varietal studies with fall crop potatoes in eastern Virginia, M. M. PARKER. (Va. Truck Expt. Sta.). (*Peninsula Hort. Soc.* [*Del.*] *Trans., 57 (1943), pp. 102-108*).—Planting experiments, 1942–1943, with Sequoia and Sebago potatoes show that the type of seed piece commonly used in spring planting (tubers 2 to 2.5 in. in diameter cut into four pieces) does not usually give a satisfactory stand of plants when planted in late summer when conditions may be droughty. Small potatoes, whole or halved, however, do not rot so readily after planting under similar conditions and usually produce good stands of strong viable plants. If the seed is reasonably disease free, these plants produce more stalks per hill, more tubers per acre, a slightly smaller size tuber, and usually larger yields of A size potatoes than the type of seed used for spring planting. Sequoia and Sebago in tests, 1940–43, have shown the most promise as fall varieties in the section.

The effect of different carriers of nitrogen on the nutrition of the potato, W. THOMAS and W. B. MACK. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 346-354, illus. 5*).—In a long-time fertilizer experiment involving potatoes, complete fertilizers containing the same amounts of P as superphosphate and K as chloride, together with either calcium nitrate, sodium nitrate, tankage, or ammonium sulfate as the N carrier, were compared with each other and with rotted manure as to influences on yield and on plant nutrition. The order of the yields was associated with foliar diagnosis (E. S. R., 81, p. 190) values in such a way that the greater the deviation of these values from those of the optimum, with respect either to intensity of nutrition (quantity factor) or to NPK equilibrium (quality factor), or to both simultaneously, the greater was the reduction in yield below that of the optimum. Although yields in general were limited by drought during the latter part of the growth cycle, differences in yield from the several plats resulted from differences in nutrition of plants determined by the different N carriers before drought intervened, as indicated by the foliar diagnosis.

The possibilities of irrigation on potatoes, J. C. CAMPBELL (*N. J. State Potato Assoc., Hints to Potato Growers, 24 (1944), No. 10, pp. [1-3]*).—Katahdin potatoes were grown in three spacings and at three fertilizer levels on Sassafras loam and received supplemental sprinkler irrigation in experiments in cooperation with B. E. Brown (U. S. D. A.). Irrigation was most efficient at 10-in. spacing of seed, and at this spacing, potatoes receiving 1,200 lb. of 5–10–10 fertilizer per acre made greater total yields and increases due to irrigation than with heavier fertilization. Advantages of irrigation in dry seasons were evident.

Rice.—I, The plant and its cultivation, C. YAMPOLSKY (*Wallerstein Labs. Commun., 6 (1943), No. 18, pp. 82-94, illus. 15*).—Part 1 is a popular account of the history, structure, and physiology of the plant, as well as agricultural practices in various parts of the world. Part 2 concerned with rice grain and its products is noted on page 765.

Grain sorghum and its uses, J. H. MARTIN. (U. S. D. A.). (*Wallerstein Labs. Commun., 7 (1944), No. 20, pp. 33-38, illus. 3*).—Characteristics of the principal varieties of grain and dual-purpose sorghums and their kernels are described, with

brief comments on the status of the crop, production practices, and data on composition and industrial uses of sorghum grain. The quantity of alcohol obtainable from grain sorghums is compared with that from other cereals.

Farmer experience with the production of sorgo for industrial alcohol in 1942, J. N. Efferson. (La. Expt. Sta.). (*Sugar Bul., 22 (1944), No. 12, pp. 91-93, 94*).—Information obtained on farm practices and problems covered activities of 67 farmers who produced 4,597 tons of sorgo on 693 planted acres in 1942. The crop, part of 7,200 acres planted and harvested, was grown in connection with contracts of the U. S. D. A. Commodity Credit Corporation with three sugar mills to grow sorgo for sirup for use in producing industrial alcohol. The 67 farms averaged 10 acres of sorgo each and 6.6 tons per acre; the crop sold for $4 per ton and the profit to the grower averaged $4 per acre, 50 ct. per ton, or 35 ct. for each hour of labor. The crop required about 37 hr. of labor per acre, or 5.6 hr. per ton, or about one-fifth that usually required to grow and harvest sugarcane. Quality of seed, use of N fertilizer, crop sequence, seeding rate, and stands were factors influencing yields. Kansas Orange sorgo usually outyielded Sumac. Possibilities and problems of sorgo production in the sugarcane area of Louisiana are discussed briefly.

Say "soybean," K. Pellett (*Soybean Digest, 4 (1944), No. 9, pp. 6-7, illus. 2*).—The tentative vocabulary of soybeans and their products, largely suggested by W. Eastman, includes 18 terms.

Nitrogen fixation, composition, and growth of soybeans in relation to variable amounts of potassium and calcium, H. E. Hampton and W. A. Albrecht (*Missouri Sta. Res. Bul. 381 (1944), pp. 36, illus. 14*).—Growth of Virginia soybeans and N fixation (E. S. R., 86, p. 18; 89, p. 540) were increased by additions of both K and Ca. Higher Ca levels stimulated N fixation more than did K increments, which functioned chiefly in production of carbohydrates. Influence of Ca on growth and N fixation was more pronounced at low than at high K levels. Ca additions increased, while K additions lessened the activity of soybeans in using Mg. A low K : Ca ratio was necessary for maximum N fixation. Higher N levels in plants were related closely to increased K intake. Compared with nonnodulated soybeans, inoculated plants were characterized by higher K, Ca, and N contents and significantly lower ratios of carbohydrate C to N. Presence of active legume bacteria on soybean roots influenced the mineral composition of the crop. Successive cropping reduced each nutrient ion to about the same low level in all cultures. K and P were absorbed or lost by soybeans depending upon the fertility level of the media, but there was no indication of Ca or Mg movement from the plants back to the soil.

Place of soybeans in the rotation, A. J. Englehorn. (Iowa Expt. Sta.) (*Soybean Digest, 4 (1944), No. 9, pp. 9-11*).—Soybeans evidently should be considered as an intertilled crop, competing with other clean-tilled crops, and fitting soybeans into the rotation will mean lengthening present systems. For example, the rotation of corn, corn, oats, and clover should probably be corn, soybeans, corn, oats, and clover. The benefit of the clover would then be passed on directly to the first corn crop, a heavy N feeder, and some benefit would accrue to the second corn crop from soybeans. Results cited from Indiana, Iowa, and Ohio Station experiments indicate beneficial effects on the following crop from growing soybeans, as well as an added advantage obtained when soybeans are grown on the contour.

Edible soybeans, E. P. Walls. (Univ. Md.). (*Peninsula Hort. Soc. [Del.] Trans., 57 (1943), pp. 53-57*).—Emperor and several other varieties have been outstanding in tests of edible soybeans during several years by the Maryland Experiment Station. The best planting dates have been May 16–31, although satisfactory yields might be obtained with plantings after early crops, as peas, are harvested.

[Research on sugar beet production and improvement] (*Amer. Soc. Sugar Beet Technol. Proc.*, [6] (*1944*), *pp. 186, illus. 3*).—Technical papers of interest to agronomists and plant breeders, and other technologists, presented at Denver, Colo., Feb. 1–3, 1944, include Control of Damping-Off of Sugar Beets by Treating Segmented Seed With Certain Fungicides and Nutrient Salts, by J. O. Gaskill and W. A. Kreutzer (pp. 1–4) (U. S. D. A. and Colo. Expt. Sta.); Seed Treatment Tests, 1943, by A. Isaksson and H. E. Brewbaker (pp. 5–9); Effect of Exposure of Germ on Quality of Stored Sheared Seed, by F. F. Lynes and C. E. Cormany (pp. 10–11); Germination Rate of Types of Sugar-Beet Seed Under Different Conditions, by F. F. Lynes (pp. 12–14); Flowability of Beet Seed as Influenced by Polishing, by C. W. Doxtator and H. E. Knapp (pp. 15–24); Segmented Sugar-Beet Seed With Special Reference to Normal and Abnormal Germination, by B. Tolman and M. Stout (pp. 25–33) (U. S. D. A.); Preparing Segmented Seed, by C. E. Cormany (pp. 34–39); Shearing and Gravity Classification of Seed, by F. T. Scalley (pp. 40–46); Experiences With Segmenting Machine and Gravity Table, by A. C. Maxson (pp. 47–52); Planter Development for Segmented Sugar-Beet Seed (pp. 53–59c) and Mechanical Harvester Development at the California Agricultural Experiment Station (pp. 91–98), both by R. Bainer (Univ. of Calif.); Securing a Stand Using Segmented Seed, by R. G. Larson (pp. 60–61); Field Data on Rate of Planting Segmented Seed, by E. V. Taylor and C. E. Cormany (pp. 62–63); Tests With Sheared Seed in 1943 at Fort Collins, Colorado, by G. W. Deming (pp. 64–70) (U. S. D. A. coop. Colo. Sta.); Method for Determining Distribution Stands for Segmented Sugar-Beet Plantings and Presentation of Resulting Data, by M. J. Buschlen and P. A. Reeve (pp. 71–73); Planting Equipment for Sheared Seed, by R. M. Cannon and A. J. Bigler (pp. 74–77); 1942 and 1943 Mechanical Thinning Summaries, by E. M. Mervine and R. Barmington (pp. 78–81) (Colo. Sta. coop. U. S. D. A.); Practical Use of Dixie Beet Thinner Under Adverse Field Conditions, by C. T. Cannon (pp. 82–84); Dixie Thinner Trials, Garland, Utah, 1943, by O. A. Christensen (pp. 85–86); Some Mathematical Observations in Connection With Mechanical Thinning, by R. M. Cannon (pp. 87–90); Experience With the John Deere Beet Harvester at the Colorado Agricultural Experiment Station in 1943, by R. Barmington (99–101) (Colo. Sta.); Report on Mechanical Harvesting of Sugar Beets for 1943, by T. W. Cockayne, C. J. Edwards, and J. E. Trinnaman (pp. 102–106); Phosphate Distributing Attachment for Manure Spreaders, by R. R. Wood and N. J. Muscavitch (pp. 107–109); Experiments in Watering Sugar Beets in Western Nebraska, by S. B. Nuckols (pp. 110–120) (U. S. D. A.); Relationship of Weather to Sugar Beet Production, by L. T. Pierce, H. L. Bush, and R. R. Wood (pp. 121–128); The Sugar Beet in Europe and America, by E. Carsner (pp. 129–133) (U. S. D. A.); The Feed Replacement Values of Sugar Beet By-Products, by E. J. Maynard (pp. 134–140); Life History and Control of the Beet Root Louse, *Pemphigus betae* Doan, by C. R. Jones (pp. 141–144) (Colo. State Col.); Variability in the Species *Beta vulgaris* L. in Relation to Breeding Possibilities With Sugar Beets, by F. V. Owen (pp. 145–149) (U. S. D. A.); A Swiss Chard Garden Beet Hybrid, by F. F. Lynes (p. 150); Midwest Varieties, by C. E. Cormany and F. F. Lynes (pp. 151–153); Variety Tests and Breeding Considerations, by H. E. Brewbaker, H. L. Bush, and R. R. Wood (pp. 154–158); Report on 1943 Tests of U. S. 215 × 216, Improved U. S. 215 × 216, and Other Varieties From Sugar-Beet Leaf-Spot Resistance Breeding Investigations of the U. S. Department of Agriculture, by G. H. Coons, D. Stewart, J. O. Culbertson, G. W. Deming, J. O. Gaskill, J. G. Lill, and S. B. Nuckols (pp. 159–161) (U. S. D. A., State stations, et al.); Some Colorado Farm Labor Problems in 1944, by A. J. Hamman (pp. 162–166); Farmer Sponsored Labor in Southern Idaho, 1943, by H. A. Elcock (pp. 167–170); Bonneville County Farm Labor Association, Inc., by P. Scalley

(pp. 171–174); Use and Organization of High School Labor in Central Utah, by W. J. O'Bryant (pp. 175–181); and Mexican Nationals, by C. F. Spaulding (pp. 182–186).

[Symposium on sugar beets in the war and post-war periods] (*Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 553-583, illus. 1*).—Papers in the symposium held at Cincinnati, Ohio, November 10, 1943, included: The Sugar Beet in the War and Post-War Period From the Standpoint of the Agricultural Engineer, by E. M. Mervine (pp. 553–557) (U. S. D. A. coop. Colo. Expt. Sta.); Agronomic Considerations of Mechanized Sugar Beet Production, by J. O. Culbertson (pp. 558–565) (Minn. Sta. coop. U. S. D. A.); Variability in the Species *Beta vulgaris* L. in Relation to Breeding Possibilities With Sugar Beets, by F. V. Owen (pp. 566–569) (U. S. D. A.); Adaptation of the Sugar Beet To Meet the Needs of the Sugar Industry in America, by H. E. Brewbaker (pp. 570-575); and Sugar Beets in the War and Post-War Periods From the Standpoint of the Beet Sugar Industry, by A. W. Skuderna (pp. 576–583).

Sweet potato seed bed management, seed and sprout treatment, T. F. Manns. (Univ. Del.). (*Peninsula Hort Soc. [Del.] Trans., 57 (1943), pp. 74–84, illus. 6*).—Recommendations on growing seed stocks on disease-free areas by use of vine cuttings, treatments of seed and sprouts for disease control, seed selection, and seedbed management are based extensively on Delaware Experiment Station research.

Studies of delayed digging of sweet potatoes of the Porto Rico variety, W. D. Kimbrough. (La. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 395–397*).—Composition and storage losses 1940–42 showed no benefit to sweetpotatoes from cutting vines the day of a killing frost. The station, however, repeats its recommendation to dig before a killing frost, especially in south Louisiana, because conditions are better then for digging and curing. Sweetpotatoes dug in cool or cold weather (E. S. R., 88, p. 352) must be handled with extreme care and should be put into the curing house the day when dug.

The effect of nitrogen fertilization on the gross morphology of timothy, Phleum pratense L., J. C. Anderson. (N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 584–589*).—Effects on timothy of April and June applications of soluble N at rates of 30 and 60 lb. per acre as sodium nitrate were studied in field plats in 1940. N applied in April consistently promoted yields of dry matter exceeding those from nontreated plats. Plats receiving N 60 lb. per acre produced hay of lower quality due to lodging and subsequent loss of green leaves. Lodging did not occur on plats with no-treatment or receiving per acre manure 10 tons or N 30 lb. Timothy on plats treated in April with N 30 lb. did not differ greatly in gross morphological composition from timothy on untreated plats. Percentage yield and total yield of green leaves dropped sharply after full bloom in all treatments. Yields of green leaves from plats receiving N 30 and 60 lb. per acre in both April and June were about equal, and significantly surpassed those from nontreated plats. Net increase in yield of green leaves per pound of N applied at early bloom was twice as great for N 30 lb. as for N 60 lb.

Liming tobacco soils, J. F. Lutz and E. C. Moss (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 2, pp. 10–11*).—Flue-cured tobacco grown at Oxford on limed soil, 1920–41, averaged 1,205 lb. per acre valued at $184, compared with 953 lb. and $136, respectively, on unlimed soil. Dolomitic limestone has been superior to calcitic limestone. The lime should be applied to the legume in the tobacco rotation, so that the tobacco following from 1 to 3 yr. later will still get enough Ca and Mg without danger of poor quality. The need for soil tests is emphasized.

Physical and chemical characteristics of typical American and Nelson tobacco-leaf samples, R. T. J. Blick (*New Zeal. Jour. Sci. and Technol., 25 (1943), No. 2, Sect. B, pp. 53–62*).—New Zealand tobacco compared favorably in chemical

composition with American tobacco, containing about the same percentages of phosphate, total N, and sugars for corresponding grades of leaf but a higher percentage of total, soluble, and insoluble ash, Ca, and Mg and less potash than American tobacco. Figures for total N, reducing sugar, and total sugar showed the largest variations in leaf of different quality, and a fairly good agreement existed between tobacco quality and the ratio total reducing sugar : total N, or, even better, the ratio total sugar : total N. The higher the quality of the tobacco, the greater was each of these ratios. Attention is called to the effects of soil type and position of leaf on the plant on the chemical composition of the leaf.

Melanism in wheat induced by high temperature and humidity, T. JOHNSON and W. A. F. HAGBORG (*Canad. Jour. Res., 22 (1944), No. 1, Sect. C, pp. 7–10*).—Under high temperature conditions, especially with high humidity, melanistic areas developed on glumes, lemmas, peduncles, and internodes of Apex and Renown wheats in absence of infection by pathogens.

Crop standardization and the production and distribution of pure seed for farm crops in Montana, S. C. LITZENBERGER, A. H. POST, and R. D. MERCER (*Montana Sta. Cir. 179 (1944), pp. 8*).—In the Montana plan of crop standardization outlined, responsibility for varietal recommendations and production of foundation seed stocks of recommended varieties is placed with the station and its branches and responsibility for operation of the plan and actual certification of seed is carried by the Montana Seed Growers Association.

Germination of buried weed seed, W. S. BALL (*Calif. Dept. Agr. Bul., 33 (1944), No. 2, pp. 105–107*).—Seed of only 2 weeds germinated in 1943 tests of seed of 12 species of California weeds buried in soil in 1932 (E. S. R., 82, p. 182). Compared with 1938 results, silverleaf nightshade showed decreased germination on an irrigated plat and increase on a nonirrigated plat, and Klamath weed seed declined greatly on both plats. Seed of morning-glory (*Convolvulus arvensis*) failed to germinate in 1943, although its viability was high in 1938.

Whitetop eradication, R. S. ROSENFELS and F. B. HEADLEY. (Coop. U. S. D. A. and Calif. Expt. Sta.). (*Nevada Sta. Bul. 170 (1944), pp. 18, illus. 10*).—Experiments in control or extermination of whitetop (*Lepidium draba, L. draba repens,* and *Hymenophysa pubescens*), conducted since 1938 largely in the Fallon area, dealt with cultivation, smother crops, chemicals, burning or searing, and flooding. Unless the weed can at the same time be eliminated from adjoining ditchbanks, fence rows, wasteland, and levees, attempts to eradicate it from cultivated fields may not be justifiable.

Flooding with whitetop completely submerged appeared to be practicable where the soil is heavy enough to hold water without excessive seepage. Whitetop may be eradicated from fields in 2 or 3 yr. by clean cultivation with knives clipping the plant just below the soil surface. Between cultivations the soil should be kept moist to favor sprouting from the roots. Dorman roots in the soil may carry over into a third season if their food reserves have not been depleted. Field trials showed that cultivation should be made every 3 weeks during the first year, but may be 4 weeks apart in the second season when the roots have lost part of their vigor. Irrigation should be delayed 2 or 3 days after cultivation to allow the cut-off portion of plants to dry out. Annual alternation of clean cultivation with grain crops did not give satisfactory control.

In attempts to smother whitetop with rank growing grasses and clovers, no one crop was entirely successful, although some prevented the weed from seeding and almost eliminated it. Yellow and white sweetclovers, meadow fescue, bromegrass, western wheatgrass, and reed canary grass were most successful for this purpose. The weed apparently can be controlled and possibly eliminated by use of these pasture grasses and legumes. Use of competitive crops, the most practical method of dealing

with whitetop infestations, permits almost continuous farming without loss of income and without the expense involved in clean cultivation and other control methods. See also an earlier note (E. S. R., 80, p. 766).

Sodium chlorate, carbon bisulfide, and other chemicals have been useful in eradicating whitetop from smaller areas, but are too expensive to use on larger ones. Small infestations may be cleared from ditchbanks, fence lines, and roadsides by hoeing, searing, or spraying with oil or chemicals.

HORTICULTURE

Summer care of the home vegetable garden, L. G. SCHERMERHORN, V. A. TIEDJENS, and P. P. PIRONE (*New Jersey Stas. Cir. 485 (1944), pp. 8*).—Information is presented on companion and succession crops, cultivation, watering, thinning plants, mulching, fertilizer use, and prevention of leaf and fruit diseases.

Cauliflower and broccoli varieties and culture, R. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 1957 (1944), pp. 17+, illus. 4*). Cauliflower, the so-called heading broccoli, and sprouting broccoli are related plants of the cabbage family. This bulletin places the so-termed heading broccoli with cauliflower and discusses the production of each group. Information is offered on varieties, soil and fertilizer needs, sources of seed, growing the plants, transplanting, culture, blanching of cauliflower, and harvesting and packing for market. Methods of controlling various important insects and plant diseases are discussed. This supersedes Leaflet 130 (E. S. R., 77, p. 783).

Lettuce and nitrogen, L. G. WILLIS (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 2, pp. 7, 8, illus. 1*).—Poor heading of lettuce is said to be nearly always caused by an excess of N in the applied fertilizer. On soils moderately well supplied with organic matter, an application of 50 lb. of N per acre before planting is believed adequate for satisfactory heads. Late side dressings with soluble N are not recommended unless the plants are very small and are not forming heads.

Criolla Roja de Louisiana, una nueva variedad de cebolla recomendable para Puerto Rico [Louisiana Red Creole, a new onion for Puerto Rico], A. RIOLLANO (*Agr. Expt. [Puerto Rico Univ. Sta.], 3 (1943), No. 4, pp. 4–6, illus. 1*).—Of a number of onion varieties tested in 1939 at the Isabela Substation only four kinds, Red Bermuda, Yellow Bermuda, Early Grano, and Louisiana Red Creole, formed satisfactory bulbs. Louisiana Red Creole outyielded the two Bermuda varieties, with 97 percent of the plants forming marketable bulbs in one test and 98 percent in the other, and showed outstanding resistance to a foliage disease identified as *Macrosporium porri*.

Growing the transplant onion crop, H. A. JONES, L. R. HAWTHORN, and G. N. DAVIS (*U. S. Dept. Agri., Farmers' Bul. 1956 (1944), pp. 25+, illus. 19.*)—From one-third to one-half of the onion acreage of the United States is grown by the transplant method. Information is presented on soil requirements, fertilizers, preparation of the soil, cultivation, harvesting, and handling of the transplants. Methods of transplanting, irrigating the crop, culture, tendency of transplants to form seedstalks, curing the crop, and favored varieties for different sections of the country are discussed. Some information on diseases and insects and their control is included.

La esponja vegetal y sus usos en la guerra actual [The vegetable sponge and its wartime uses] (*Agr. Expt. [Puerto Rico Univ. Sta.], 3 (1943), No. 4, p. 9*).—Brief information is presented on the source, botany, culture, preparation, and use of the gourd, known as vegetable sponge, dishrag gourd, and other common names.

Washington State: A new forcing tomato, C. L. VINCENT (*Washington Sta. Bul. 436 (1944), pp. 12, illus. 2*).—Derived from a cross made in 1928 between Bonny Best and Sutton Best of All, this variety has proved to be an excellent green-

house tomato because of its productivity and attractive fruits. For field use, the fruits are too small unless the vines are staked and pruned and grown in very fertile soil. In yield tests Washington State over a period of years averaged 9.8 lb. of fruit per plant as compared with 10.0 lb. for Michigan State Forcing, 7.5 lb. for Bonny Best, and 7.9 lb. for Sutton Best of All. The somewhat heavier production of Michigan State was offset by variability in size and roughness of the fruits. Washington State kept longer in storage than did the other three varieties. Adequate setting in the greenhouse was obtained by jarring the plants with an electric buzzer or by tapping the stems.

Light and heavy pruning, compared with no pruning, of apples, C. W. Ellenwood and T. E. Fowler (*Ohio Sta. Bimo. Bul. 229 (1944), pp. 219–227, illus. 5*).—Observations on Baldwin and Stayman Winesap trees planted in 1916 and subjected to different degrees of pruning from none to heavy winter pruning plus summer heading back led to interesting observations. Pruning in any degree reduced appreciably the yield of Baldwin. Light pruning increased slightly the yield of Stayman Winesap trees as compared with no pruning. The fruits of the unpruned trees, particularly in the later years, were smaller than those from the pruned trees. This difference was more evident in Stayman Winesap. Color of fruit was better on the pruned trees, more so in Baldwin than in Stayman Winesap. Variety is deemed an important consideration in determining pruning practices.

Soil and seasonal influences on the chemical composition of McIntosh apple leaves in New York, D. Boynton, J. C. Cain, and O. C. Compton. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 15–24, illus. 1*).—Analyses of leaves collected over a period of 6 weeks in 1941 and over a period of a month in 1942 in McIntosh apple orchards in the Hudson River Valley, in western New York, and in the Champlain Valley showed a decline in K and P percentages in all samples as the season advanced, while at the same time the Ca percentage and perhaps the Mg percentage was increasing. Both the mean K percentage data for the three regions and the frequency distribution of orchards according to K percentage in the leaves indicated that K deficiency may be more frequently encountered in the Champlain Valley and western New York than in the Hudson River Valley. Evidence was also obtained that differences in season may produce significant differences in K and Mg percentages occurring in McIntosh apple leaves of the same age. Differences in rainfall may have caused the observed differences in leaf composition. More instances of K deficiency leaf scorch were seen in the Champlain Valley and in western New York than in the Hudson Valley.

The performance of seedlings derived from selfing and crossing the McIntosh apple, R. Wellington and G. H. Howe. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 273–279*).—Many crosses were made using McIntosh as either pollen or ovule parent. A study of the resulting seedlings showed that certain combinations gave vigorous seedlings and others a high proportion of weak trees. Weak trees were most prevalent in McIntosh selfed and in McIntosh crossed with Cortland, Delicious, Baldwin, and Rhode Island Greening. Only 1 of 835 seedlings that have reached the fruiting age was found sufficiently promising to be named. This was Greendale from a McIntosh × Lodi cross. Information is presented on the inheritance of various characters such as season of ripening, size of fruit, shape of fruit, color of skin and flesh, skin texture, flavor, etc. Although McIntosh has produced many high quality seedlings, it produces mostly poor or fair quality progeny. The number of good quality offspring was influenced by the quality of the other parent.

The effect of the rootstocks on ten years' growth and yield of the Gallia Beauty apple, R. H. Sudds. (W. Va. Expt. Sta. [coop. U. S. D. A.]). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 236–238*).—Designed to supplement an earlier

paper (E. S. R., 89, p. 670), records are presented on the weight of tops of Gallia Beauty apple trees propagated on various rootstocks. In general, the larger the tops of the trees, the larger were the yields of fruit up to the time of tree removal. The consistenly favorable records of trees on U. S. D. A. 316 and on Jonathan seedlings both for large tree size and large yields emphasized the value of these rootstocks for Gallia Beauty. Even these rootstocks did not cause excessively large trees of this variety.

Pear growing and handling in Washington, E. L. Overholser, F. L. Overley, and D. F. Allmendinger (*Washington Sta. Pop. Bul. 174 (1944), pp. 84, illus. 21*).—Information is presented on the growing and handling of pears, including such matters as selection of proper sites for the orchard, varieties, understocks, general management, pollination, harvesting and handling, refrigerator cars, storage requirements, chemical composition of the fruit, insect and disease prevention, etc.

Effects of irrigation and of plant spacing upon runner production and fruit yield of the Corvallis strawberry, G. F. Waldo. (U. S. D. A. coop. Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 289–294*).—Most of the runners of the Corvallis strawberry are produced during July and August, a period in which rainfall is inadequate in the region west of the Cascade Mountains in Oregon to maintain normal plant development. Under these conditions, irrigation during July and August resulted in greatly increased production of runner plants. In a season with very little rainfall in September, irrigation in late summer greatly increased fruit yield the succeeding season. The best yields of Corvallis strawberries were obtained with between 14,000 and 32,000 well-spaced plants per acre, consisting either entirely of spring-set mother plants or of spring-set plants plus early-rooted runner plants, with excess runners removed. If cost of removing excess runners is too high, the author suggests limiting irrigation to one late-summer application.

Fewer berries from renovated beds, E. B. Morrow (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 1, pp. 5–6, illus. 1*).—The renovation of strawberry beds after harvest failed to give good results, the yields the succeeding year being less than other treatments including matted rows, double rows, and triple rows. It was evident that barring off to a narrow row may result in a poor stand of new plants under hot summer conditions. Results are in favor of maintaining old plants for at least 2 yr. by working up the middles between rows soon after harvest and by removing excess runners in late summer or early fall.

Fertilizer experiments with strawberries in Oswego County, New York, R. C. Collison. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 295–298*).—In a preliminary experiment in 1937–38 with the Chesapeake strawberry, evidence was obtained that stable manure satisfied the nutrient needs of the crop. In later experiments with the Catskill variety, designed to study the effects of various fertilizer with and without manure, commercial nitrogen returned very satisfactory yields without manure. There was evidence that manure should either be in a well-rotted condition, or if containing considerable bedding materials should be applied well in advance of setting strawberry plants. Supplementing manure before plowing under with commercial nitrogen is also suggested. If properly fertilized before setting, it is considered doubtful whether later side dressings are necessary or even advisable. Neither P nor K were helpful under the conditions of the experiment, and the various N carriers were about equally valuable when applied on the basis of equivalent N. N fertilizers delayed the picking season slightly, which was advantageous under the existing marketing conditions.

Strawberries need borax, L. G. Willis (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 1, p. 7*).—An application of 5 lb. of borax per acre distributed in dry form on top of the strawberry rows or as a spray was found beneficial, resulting in large crops of symmetrical good-flavored berries. The borax

should be applied in late summer or early fall on soils which have been adequately limed. The tests were made in home gardens on Fairfax and Eleanor Roosevelt varieties.

A second report on the breeding of autumn-fruiting red raspberries, G. L. Slate and R. F. Suit. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 283–288*).—Promising autumn-fruiting selections discussed in an earlier paper (E. S. R., 84, p. 193) were uned in 1940 to produce another generation of seedlings. Contrary to expectation the populations produced by crossing autumn-fruiting selections with one another, with Indian summer, and with Ranere did not yield all fall-fruiting seedlings. In fact the percentages of autumn bearers were not materially greater than were obtained in crossing spring-fruiting varieties and Indian summer. Many of the autumn bearers fruited too late in the season to be commercially desirable. As to vigor, the progenies of crosses between species or between varieties not closely related were generally more vigorous than the progenies of closely related parents. Powdery mildew was a serious factor on some of the progenies, especially in certain groups in which Ranere was one of the parents.

The influence of promptness of topping black raspberries on growth and productiveness of canes, W. H. Childs. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 280–282*).—The plants in a 4-year-old Plum Farmer black raspberry field were thinned to four canes each and these topped at 18 in. when attaining four heights, namely, 20–24, 30–34, 40–44, and 50–54 in. There was a significant decrease in growth of laterals and in yields when topping was delayed beyond the 20–24-in. height. The taller the canes were permitted to grow, the greater was the decrease in both lateral growth and in yield. Diameter of canes was influenced but little by the time of topping. A secondary but important consideration was the significant decrease in wind damage to the early topped canes. Furthermore the laterals on the late topped canes failed to mature properly in many cases and suffered winter injury.

Investigations in budding the highbush blueberry, S. Johnston. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 301–302*).—Vigorous shoots growing from the pruned stumps of Rubel plants were budded at a favorable stage of development using five different materials as ties or wraps. Rubber budding strips coated with melted paraffin proved to be the best treatment. Removing the wood from the bud shield gave better results than when not removed, suggesting the desirability of budding blueberries early in the season before the bark tightens. The use of paraffin as a bud coating was of no value if the wood was removed from the bud shield.

A comparison of manures applied to cultivated blueberries, J. S. Bailey. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 299–300*).—In the spring of 1941, horse, cow, and poultry manures were applied to plats of cultivated blueberries so arranged that each contained Rubel, Pioneer, and Cabot varieties. An analysis of yield records indicated that there was no significant difference in yield or size of fruit between the three kinds of manure tested. Manure was not detrimental, and was apparently more beneficial than chemical fertilizers used on a nearby blueberry planting.

Quality of fruit from own-rooted and budded orange trees, F. F. Halma. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 223–226, illus. 2*).—Plantings were made in 1932 of Valencia and Washington Navel oranges both as own-rooted trees and budded on sweet orange rootstocks. Studies of the juice of fruits collected from the different types of trees showed in the case of the Valencia that fruit from own-rooted trees was generally higher in total solids, consistently higher in acid, and lower in solids-acid ratio than was fruit from budded trees. Navel oranges showed an opposite trend, with fruit from own-rooted trees being lower

generally in total solids and acids and higher in solids-acid ratio. From a commercial viewpoint, the differences were not sufficient to cause a different rating in quality.

San Piero, the Brown Turkey fig of California, I. J. Condit. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Proc., 44 (1944), pp. 211–214*).—A study of the literature and of available plant material indicated that the Brown Turkey fig of California is a different variety from varieties grown under the same name in southeastern United States and in England. The California variety is believed identical with the San Piero described by Gallesio in Italy in 1820. The same fig is found in Spain, in southern France, and in England. In southern California the brown Turkey figs appear on the market in May and again in autumn as large purple figs, sometimes offered under the erroneous name of Brunswick.

Growing cinchona under American control, A. F. Fischer (*Torreya, 44 (1944), No. 1, pp. 1–5*).—An address reviewing the cinchona work of the U. S. Government in the Philippines and the present work in Puerto Rico and Hawaii, as well as the surveys and cooperative projects in Tropical America.

Pyrethrum cultivation in Kenya, R. S. Ball (*Bul. Imp. Inst. [London], 42 (1944), No. 1, pp. 13–24*).—This paper deals only with the culture of pyrethrum and not with the drying of the crop.

Experiments on the culture of narcissus, A. G. Smith, Jr. (*Virginia Sta. Bul. 357 (1943), pp. 16, illus. 6*).—Fertilizer experiments in a field of King Alfred and Emperor narcissus planted in September 1940 on a Sassafras soil near Gloucester, Va., yielded some valuable although preliminary information. Fertilizers containing superphosphate and potash but no nitrogen produced the earliest flowers of good quality but the bulbs were inferior. When a proprietary mixture of minor elements was added, both flowers and bulbs were outstanding in quality. Bonemeal alone or combined with minor elements was not as effective as when combined with potash. In general, bonemeal appeared to delay the opening of the blooms. There was evidence that moderate applications of lime were benficial on the particular type of soil dence that moderate applications of lime were beneficial on the particular type of soil used in the investigation.

FORESTRY

The use of hydroponics in the practice of forestry, R. V. Olson. (Wis. Expt. Sta.). (*Jour. Forestry, 42 (1944), No. 4, pp. 264–268, illus. 2*).—Seedlings grown in glazed jars containing sphagnum moss watered with a nutrient solution made much better growth than comparable plants in fertilized nursery soil. Analyses of the plants showed a higher content of N, P, and K and also a better balance of these elements. The root systems of the nutrient-fed trees were greatly superior to those of the soil-grown trees. Growth of seedlings following transplanting to nursery beds was very promising, suggesting real possibilities in the nutrient-culture method.

Reproduction in oak-hickory forest stands of the Missouri Ozarks, F. G. Liming and J. P. Johnston. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 3, pp. 175–180, illus. 1*).—Most of the forest stands in the Missouri Ozarks have been overcut, overgrazed, and burned repeatedly. As a result their present productivity is far below the potential capacity of the land, and natural regeneration has not been satisfactory during the last 50 yr. Reproduction is largely of sprout origin—slow growing, poor in form, and composed of a high proportion of less desirable species. With adequate protection, the stands would improve and the quality and quantity of natural reproduction would increase.

Single-leaf piñon and Utah juniper woodlands of western Nevada, J. L. Reveal. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 4, pp. 276–278*).—This article presents information concerning the stand and tree characteristics of the

single-leaf piñon (*Pinus monophylla*) and Utah juniper (*Juniperus utahensis*), species of major importance in the wood economy of the Great Basin.

Effect of thinning in the Black Hills, E. Stuart, Jr., and J. Roeser, Jr. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 4, pp. 279–280*).—A comparison of thinned and unthinned stands occupying comparable sites and exposures showed a marked increase in the growth percentage, calculated by Pressler's formula, for the thinned stands. Furthermore, in the thinned areas much of the increase was made by the larger trees where it was really worth while.

Remeasurement of permanent sample plots on Arnot Forest, A. B. Recknagel. (Cornell Univ.). (*Jour. Forestry, 42 (1944), No. 4, pp. 293–294*).—A remeasurement in the late summer of 1943 of permanent plats established in the fall of 1927 and the spring of 1928 in the Arnot Forest, N. Y., showed the beneficial effects of selective thinnings on growth. In three of the unthinned control plats where there was an average of 554 trees per acre, growth had come practically to a standstill. On lightly cut plats where the average number of trees was 472 per acre, growth was only fair. On heavily cut plats with 330 trees per acre, growth was much better. Hemlock took particular advantage of the release and became aggressively dominant on the thinned plats from which the overtopping hardwoods had been removed.

The growth of timber in Indiana farmwoods, D. DenUyl. (Ind. Expt. Sta.). (*Jour. Forestry, 42, (1944), No. 3, pp. 169–174, illus. 3*).—In 1931 and 1932, 70 permanent sample plats were established in selected farm woodlands in 16 counties in northern Indiana. Measurements showed that the actual volume increment under the growing conditions present in the average farmwoods varied from about 100 to 350 bd. ft. per acre per year. Of the type species in the oak-hickory stands, red oak was the best grower followed by black oak, white oak, and hickory. In the beech-maple type, elm was the leading grower followed by ash, basswood, and sugar maple. In the upland swamp type, white oak had the highest growth ratio followed by red oak, red maple, elm, and ash. On the basis of growth characteristics, frequency of occurrence, and relative commercial importance, red oak is the best grower and elm next. The major emphasis in farmwood management should be placed upon the better growing species and their diameter class distribution for the continuous production of high-quality timber.

Comparative productiveness of adjacent grazed and ungrazed sugar-maple woods, C. A. Dambach (*Jour. Forestry, 42 (1944), No. 3, pp. 164–168, illus. 1*).—Observations in two contiguous areas, one protected from grazing since 1932 and the other continuously grazed during the same period, showed that the production of maple sirup had increased in the ungrazed woods and was greater on a comparable basis than in the adjacent grazed area. The grazed woods showed a loss of 0.3 tree per acre per year as compared with a gain of 4.2 trees per acre per year in the ungrazed tract. Abundant reproduction was present in the ungrazed area, but no young trees and only a few seedlings had developed in the grazed woods during the same period. There was a considerable loss in potential income due to pasturing the woodlands.

Measurement of grazing use by the line interception method, R. H. Canfield. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 3, pp. 192–194, illus. 1*).—Field experiments indicated that a sampling unit 50 ft. long is adequate on ranges supporting a grass cover of 5 percent or more, whereas ranges having less than 5 percent of the area occupied by perennial grasses require a sampling unit 100 ft. in length. The latter was used in field tests on the Santa Rita Experimental Range in Arizona.

Notes on Christmas tree farming, J. A. Cope. (Cornell Univ.) (*Jour. Forestry, 42 (1944), No. 4, pp. 250–254, illus. 2*).—Of four species grown in Volusia soil near Ithaca, N. Y., to test their potential value as Christmas trees, Douglas fir proved outstanding. This species grew rapidly, maintained symmetry and compact-

ness, held its needles after cutting, and was not attacked by insects. The other species—Norway spruce, white spruce, and balsam fir—had various serious defects that reduced their utility as Christmas tree material.

Progress report on catalpa fence post test, R. R. PATON (*Ohio Sta. Bimo. Bul. 229 (1944), pp. 217–218*).—In 1934 a group of catalpa posts, part of which were seasoned and part freshly cut were set along a station roadway. At the end of the tenth summer season eight posts were dug and examined. There was no discernible difference between the seasoned and unseasoned posts and for the most part all were in reasonably good condition. The conclusion is reached that posts cut from slow-growing, hardy catalpa trees should endure well over 10 yr. in moderately well drained upland soil.

Cull as determined from basal wounds in Kentucky highlands timber, R. O. GUSTAFSON. (Univ. Ky.). (*Jour. Forestry, 42 (1944), No. 3, pp. 181–184*).—Studies of trees, half with and half without open basal wounds and made upon 15 major species in the highlands of eastern Kentucky, indicated that the presence or absence of an open basal wound is a major factor relating to cull in merchantable timber. On the average, trees with an open wound had more than five times as much basal cull as trees without such wounds. Top cull was about the same in both classes of trees. A method is described for using open basal wounds as an index of cull in merchantable timber.

A method of volume-diameter ratios for board-foot volume tables, W. H. MEYER (*Jour. Forestry, 42 (1944), No. 3, pp. 185–189, illus. 6*).—There is presented a new technic for using the volume-diameter ratio in the construction of board-foot volume tables. The apparent major advantage of the new method lies in reducing the relationship between board-foot volume, diameter, and merchantable length to three straight-line functions.

PLANT DISEASES

Studies in the physiology of host-parasite relations, I–III, B. J. GRIEVE (*Roy. Soc. Victoria, Proc., n. ser., 53 (1941), No. 2, pp. 268–299, illus. 16; pp. 323–341, illus. 7; 55 (1943), No. 1, pp. 13–40, illus. 9*).—The following papers are included:

I. *The effect of Bacterium solanacearum on the water relations of plants.*—The effects of *B. solanacearum* on the water relations of tomato and potato plants are analyzed in relation to speed of invasion and production of leaf epinasty and wilting.

II. *Adventitious root formation.*—A detailed account is given of the development of adventitious roots in plants infected by *B. solanacearum*, along with comparisons of similar effects induced by *B. tumefaciens* and *Aplanobacter michiganense*, by synthetic growth substances, by wounding and blocking of stems, and by the influence of gravity.

III. *Factors affecting resistance to bacterial wilt of Solanaceae.*—Studies on the invasion of potato and tomato plants by *B. solanacearum* indicated that high soil moisture, temperatures over 66° F., light intensities over 800 footcandles, and high humidity favor the disease in the greenhouse. A correlation was also made with conditions obtaining in the field in Victoria. The rate of movement of the parasite in the vascular system was 5 mm. per hour for potato and 2.2 mm. for tomato at 73°. The cardinal temperatures for growth of the organism were 15°, 32°, and 35° C. Significant increases in height, vessel size, and water content developed in plants grown in wet soil; the increased water content is believed the factor influencing susceptibility to invasion. Results of growth experiments showed a positive relation between disease spread and vigor of growth of the host plant.

Some ways by which nutrition may affect severity of disease in plants, G. M. SHEAR and S. A. WINGARD. (Va. Expt. Sta.). (*Phytopathology, 34 (1944), No. 6, pp. 603–605*).—The findings of Spencer and McNew (E. S. R., 79, p. 207;

82, p. 348) regarding the effect of K deficiency in increasing the susceptibility of sweet corn to bacterial wilt (*Phytomonas stewartii*) are interpreted on the basis of nutritional studies on tobacco. These studies indicated K deficiency to result in an accumulation of nitrate N in the conductive tissue; since high nitrate N in the conductive tissue of corn has been shown to increase its susceptibility to wilt, this would appear to explain the influence of K deficiency on the disease. The effects of a deficiency of N, P, or K on the concentration of the other two in the conductive tissue of a plant and their possible relationship to disease susceptibility are pointed out.

Mechanism of abnormal and pathological growth: A review, B. J. GRIEVE (*Roy. Soc. Victoria, Proc., n. ser., 55 (1943), No. 1, pp. 109–132*).—Recent work is reviewed (nearly four pages of references) on the mechanism of abnormal and pathological growths in plants with special reference to those induced by *Bacterium tumefaciens, B. solanacearum,* and *Rhizobium* spp. The hypothesis that indole-3-acetic acid produced by the bacteria in the plant causes the cell proliferation or other stimulation is regarded as unlikely. Though the phenomena still strongly suggest the action of growth substances, researches thus far have not substantiated the alternative hypothesis that the physical presence of the bacteria may stimulate the plant to increased production of growth substance leading to cell proliferation. Other trends in recent research on this problem are indicated.

Air-borne spores and plant quarantines, W. A. MCCUBBIN (*Sci. Mo., 59 (1944), No. 2, pp. 149–152*).—A general discussion, with the conclusion that the slight possibility of disease introduction by air is far too small to affect materially the worth of the plant quarantine effort, the primary concern of which is to prevent disease and insect introduction by establishing a watch over the controllable channels of human travel and commerce.

The Plant Disease Reporter, [June 1, 7, 15, and 22 and July 1, 7, 15, and 22, 1944] (*U. S. Dept. Agr., Plant Disease Rptr., 28 (1944), Nos. 15, pp. 495–520; 16, pp. 521–545; 17, pp. 547–578, illus. 2; 18, pp. 579–608; 19, pp. 609–636, illus. 2; 20, pp. 637–670; 21, pp. 671–695, illus. 2; 22, pp. 697–736*).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to cereals and grasses, field legumes, potatoes, vegetables, fruits, special crops (e. g., fiber, sugar, rubber, tobacco), and miscellaneous plants, the above issues contain the following signed notes and articles:

No. 15.—*Xanthomonas phaseoli* var. *fuscans* on beans in New York State, by W. H. Burkholder; a cause of "physiological leaf spot" of cereals, by K. S. Chester; diseases observed on wheat and grasses in New York, by L. J. Tyler; diseases on barley and wheat in West Virginia by C. F. Taylor, and in Ohio by M. R. Harris; diseases of small grains in Georgia (with tabulated data) by G. M. Stone, in South Dakota by J. W. Tervet, and in Arizona by W. G. Hoyman; cereal disease survey in Kansas and Nebraska, by S. M. Pady; curly top on flax and other flax diseases in central California in 1944, by H. L. Barnett and B. R. Houston; alfalfa diseases observed in Montana during May 1944, by C. M. Slagg; diseases on pears and stone fruits in central California, by H. L. Barnett; and diseases of fruit crops in Washington, by L. W. Boyle.

No. 16.—Survey for potato diseases in California, by H. L. Barnett; storage diseases of table and seed potatoes in Wisconsin, by E. E. Honey; small grain disease survey in Kentucky by L. M. Josephson and R. A. Hyre, in Missouri by T. W. Bretz, and in Kansas and Nebraska by S. M. Pady; leaf spot on oats and other diseases on small grains in Iowa, by E. F. Vestal; diseases observed on small grains in Minnesota and South Dakota, by I. W. Tervet; and various reports on injury due to weather conditions.

No. 17.—Potato diseases in Maine, by R. C. Cassell; tomato disease survey in Pennsylvania by L. J. Tyler, and in southern Georgia by G. M. Stone; tomato diseases in

east Texas, by G. E. Altstatt; diseases of greenhouse tomatoes in Missouri, by T. W. Bretz; diseases on small grains in Virginia and West Virginia by C. F. Taylor, wheat and oats in Missouri by T. W. Bretz, and cereal crops and flax in Minnesota and South Dakota by I. W. Tervet; cereal disease survey in Kansas and Nebraska, by S. M. Pady; diseases of grasses in Oklahoma, by D. A. Preston; fungi associated with decline of citrus and avocado in California (with tabulated data), by J. V. Harvey; and condition of citrus groves in Florida, by A. S. Rhoads.

No. 18.—Diseases on wheat and barley in Pennsylvania by L. J. Tyler, wheat in northeastern Ohio by M. R. Harris, and small grains in southeastern Tennessee by R. A. Hyre; wheat nematode in Tennessee, by C. D. Sherbakoff; diseases of small grains and grasses in North Dakota (with tabulated data) by I. W. Tervet and R. Sprague, and cereal crops in Iowa by E. F. Vestal; cereal disease survey in Kansas, by S. M. Pady; late blight on tomato in Louisiana, by I. L. Forbes and L. H. Person; tomato diseases in Pennsylvania, by L. J. Tyler; diseases observed on cucurbitaceous crops in Florida, by A. S. Rhoads; nematode survey in Southeastern States, by A. L. Taylor; and fruit diseases in California, by H. L. Barnett.

No. 19.—Notes on apple rots in Washington (with tabulated data), by H. English; weather, crop, and cereal disease conditions in Kansas, by C. O. Johnston; and some diseases of onions grown for seed in Louisiana, by E. C. Tims.

No. 20.—California citrus psorosis survey, by J. S. Tidd; prevalence of *Rhynchosporium* scald on barley in Arkansas in 1944, by H. R. Rosen and H. W. Larsh; control of potato late blight in lower Rio Grande Valley with an organic fungicide plus zinc sulfate and lime, by G. H. Godfrey; tomato disease survey in central California, by H. L. Barnett; and the nomenclature of the cereal smut fungi (with tabulated list of common and scientfic names), by J. A. Stevenson and A. G. Johnson.

No. 21.—Peanut seed treatment in Virginia, 1944, by E. K. Vaughan; the quality of flax seed from Minnesota, North Dakota, and Montana in 1943, by I. W. Tervet; storage diseases of potatoes in Maryland, by E. A. Walker; and diseases of canning peas observed in Wisconsin, by E. E. Honey and W. W. Hare.

No. 22.—Microflora of oats from Minnesota and North Dakota (with tabulated data), by I. W. Tervet; notes on diseases of cereals and grasses in Minnesota and North Dakota, by R. Sprague; and peach branch cankers in Virginia and West Virginia, by C. F. Taylor.

Plant disease surveys in the western United States in 1943 (*U. S. Dept. Agr., Plant Disease Rptr., 1944, Sup. 149, pp. 303–407, illus. 3*).—Summaries of the 1943 plant disease situation are presented for North and South Dakota, by I. W. Tervet; Nebraska and Kansas, by S. M. Pady; Oklahoma, by H. W. Larsh; Texas, by G. M. Watkins; Montana, by H. A. Harris; Wyoming and Colorado, by E. W. Bodine; Arizona and New Mexico, by W. G. Hoyman; Utah, Nevada, and southern California, by S. B. Locke; California, by H. L. Barnett; Oregon and Washington, by L. W. Boyle; and Idaho, by E. C. Blodgett. See also a previous part (E. S. R., 91, p. 551).

Viruses described primarily on ornamental or miscellaneous plants, P. Brierley (*U. S. Dept. Agr., Plant Disease Rptr., 1944, Sup. 150, pp. 409–482*).—The codification of published information on the classification of plant viruses is one of the projects of the American Phytopathological Society. In the present report only those viruses described primarily on ornamental or miscellaneous plants are treated, not those described primarily on crop plants, but also affecting ornamentals. The attempt has been made in this tentative list to include all viruses in this field for which experimental transmission is claimed. The form of description used is adapted from Hildebrand et al. (E. S. R., 87, p. 691); the names of host plants are usually given in the form reported by investigators. The viruses are arranged alphabetically according to the generic name of their principal host plants.

Notes on Wisconsin parasitic fungi, IV, H. C. Greene. (Univ. Wis.). (*Farlowia, 1 (1944), No. 4, pp. 569–581*).—"These notes are a continuation of those of the late J. J. Davis, who published at intervals on the parasitic fungus flora of the State of Wisconsin for a period covering nearly half a century, from 1893 to 1937." Unless otherwise stated, the fungi here mentioned were collected in the vicinity of Madison during 1943.

A preliminary account of the plant diseases of El Salvador, J. A. Stevenson and F. L. Wellman. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 8, pp. 259–268*).—The collections here reported upon were all made in 1943 during May-July and the first half of August. The material is here presented on a host basis and in alphabetical order of the technical names of the plants; disease-producing fungi are also listed alphabetically under the hosts. Previous published accounts of the plant diseases of the country have been comparatively few; these are briefly discussed (six references).

La obra fitopatológica de L. Hauman en la Argentina, J. B. Marchionatto (*Buenos Aires Univ., Rev. Facult. Agron. y Vet., 10 (1943), No. 3, pp. 363–369; Eng., Portug. abs., p. 369*).—The phytopathological work of L. Hauman in Argentina (1907–25) is reviewed (18 references) and evaluated.

Species of Phytophthora as water moulds, E. Blackwell (*Nature [London], 153 (1944), No. 3886, p. 496, illus. 1*).—The author found that parasitic species of *Phytophthora* may live for long periods as water molds and suggests that they may be thus dispersed in water and carried to fields where they may become parasitic on crop plants. Suggestions for further studies along this line are presented.

Fungi of the northwestern Himalayas: Ustilaginales, B. B. Mundkur (*Mycologia, 36 (1944), No. 3, pp. 286–293, illus. 1*).—This paper concerns a taxonomic study of 21 collections of smut fungi from northwestern India; 2 new species and 5 new records for India are involved.

Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens.—XII, Die Wirkung von Apfelemanation auf Erreger und Wirtspflanze [Plant cancer and the causal P. tumefaciens.—XII, The action of apple emanation on parasite and host], C. Stapp (*Zentbl. Bakt. [etc.], 2. Abt., 106 (1943), No. 8–10, pp. 167–171, illus. 3*).—When strongly rooted seedlings of *Pelargonium zonale* and *Datura tatula* several weeks old—supporting young tumors resulting from artificial inoculation—were subjected to the emanations from apple fruits no inhibitory action on the host plants or stimulatory effect on the cancer tissue was observed, as had been claimed by V. Nábělek for young sunflower seedlings and their tumors. Promotion of tumor growth was obtained only by the higher relative humidity under the bell jar. Development of the bacteria on agar bouillon was not influenced by the apple emanations, but stimulation of their growth followed if the freshly cut surface of an apple was laid directly on the agar, whereupon material from the apple could diffuse into the substrate.

Variations in single ascospore isolates of Sclerotinia sclerotiorum, D. M. Coe (*Mycologia, 36 (1944), No. 3, pp. 234–241, illus. 3*).—This paper reports the results of priliminary studies with single-ascospore isolates in which self-fertility and homothallism for sex was again demonstrated and also wherein a segregation for cultural and other characters was encountered. That no obvious differences between the parent isolate and the N (normal) type isolates were observed introduces a possibility of the involvement of multiple factors. Continued investigation along physiological and pathological lines may eventually reveal criteria in which the N type differs from the parent type as well as further differences between the A (aberrant) and N types. It is noted that the A type has apparently never been isolated directly from diseased plants; this may indicate that the A type is incapable of parasitism, that a sexual union by anastamosis occurs, or that the microconidia do have a sexual function.

Volutella buxi and Verticillium buxi, B. O. Dodge (*Mycologia, 36 (1944), No. 4, pp. 416–425*).—Culture experiments indicated these fungi to be distinct species (see also a previous note (E. S. R., 91, p. 308)). Attention is called to a number of exsiccati specimens variously distributed as *Penicillium roseum, Volutella buxi, Verticillium buxi, Mucor hyalinus,* and otherwise; their taxonomic relationships are discussed. Regardless of whether different races or even species are concerned in what the author here refers to as *"Volutella"* on boxwood, it is believed there can be no question that H. O. Juel was right in 1925 in saying that *Verticillium buxi* is an entirely distinct species.

Studies on soil conditions in relation to root-rot of cereals, C. R. Millikan (*Roy. Soc. Victoria, Proc., n. ser., 54 (1942), No. 2, pp. 145–195, illus. 12*).—This contribution embodies the results of studies on the nutrition of the root- and foot-rot fungi, mineral treatments in relation to the apparent severity of these diseases, and the influence of the soil flora on the availability of soil minerals. Under the experimental conditions, Mn, Cu, Zn, and Fe proved essential to the growth of *Fusarium culmorum, Curvularia ramosa,* and *Helminthosporium sativum;* amino N improved the yields of the first two but caused sectoring in the last, which was stimulated, however, by thiamine, ascorbic acid, and niacin. The results, described in detail, suggest that soil-inhabiting organisms may affect the growth of the plant indirectly by using the soil nutrients for their own vital processes, thus reducing the amounts available to the plant. As the real effect of the root rot fungi on plant growth may be considerably less than their apparent effect, it is highly important to distinguish between symptoms caused by physiological disorders induced by unfavorable environal factors and those caused by the direct effects of foot- and root-rot organisms. Alleviation of the physiological disorders will appreciably decrease the apparent severity of these diseases.

An improved method of determining the smut spore load of cereal seed, W. J. Cherewick (*Canad. Jour. Res., 22 (1944), No. 3, Sect. C, pp. 120–126, illus. 2*).—Determinations of the smut spore loads on cereal seed samples revealed that, owing to the variability in surface tension and viscosity of the washings and apparently also to some electrical effect, the spore counts were unreliable. These apparent sources of error were very largely eliminated by adding to the washing water a proprietary wetting agent that not only was a good electrolyte but also effectively reduced the surface tension, and by adding to the residue a gelatin sol which, by virtue of its colloidal properties, promoted a better distribution of the spores.

Stripe reaction of spring barley varieties, H. L. Shands and D. C. Arny. (Wis. Expt. Sta.). (*Phytopathology, 34 (1944), No. 6, pp. 572–585*).—Over an 8-yr. period 375 barley varieties and selections were tested for reactions to the stripe disease by bringing germinating barley kernels into contact with the mycelium of *Helminthosporium gramineum.* Some varieties proved highly resistant to cultures of the fungus used; others were intermediate in reaction, and still others were susceptible. Oderbrucker (C. I. 4666)—used as the inoculated check 91 times in the series of tests—averaged 75 percent stripe-infected plants, indicating the effectiveness of the inoculation method. Physiologic specialization of the fungus may influence varietal responses to inoculation, and the host response may differ distinctly between varieties. Since they have other desirable characters, some of the stripe-resistant varieties may be of value as breeding stocks.

Linkage of resistance to Erysiphe graminis tritici and Puccinia triticina in certain varieties of Triticum vulgare Vill., I. A. Watson and E. P. Baker (*Linn. Soc. N. S. Wales, Proc., 68 (1943), pt. 3–4, pp. 150–152*).—The wheat varieties Thew and Kenya 744 are resistant to race 1 of *E. graminis tritici* and to race 95 of *P. triticina.* In each variety resistance to both diseases was found apparently con-

trolled by the same gene or by two very closely linked genes. The gene in Kenya 744 is allelic to that in Thew.

La herrumbre o chahuixtle de trigo [Black stem rust of wheat], J. Rodríguez Vallejo (*Fitófilo, 2 (1943), No. 4, pp. 3–34, illus. 5*).—A general account of the disease caused by *Puccinia graminis tritici.*

The nomenclature of the broomcorn millet smut fungus, J. A. Stevenson and A. G. Johnson. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 6, p. 613*).—*Sphacelotheca destruens* is presented as a new combination for *Caeoma destruens.*

Dodder on flax and its control, G. Garcia Rada (*Phytopathology, 34 (1944), No. 7, pp. 704–705*).—Losses of flax through attacks by *Cuscuta indecora in Peru* have sometimes become serious; the problem here was not only a matter of prevention but of finding a killing agent for the parasite that would not injure the host plant. After testing a large number of chemicals in various concentrations, it was found that satisfactory results could be obtained with an aqueous solution of NaOH at 8–10 parts per 1,000, depending on the developmental stage of the flax. Detailed directions for applying are given.

Studies on the biology and pathogenicity of Colletotrichum indicum, L. Ling and J. Y. Yang (*Ann. Bot. [London], n. ser., 8 (1944), No. 29, pp. 91–104, illus. 6*).—A species of *Colletotrichum* differing morphologically from the conidial stage of *Glomerella gosspyii* was observed on diseased cotton bolls and cotyledons in west China; it was considered identical with *C. indicum.* The cultural and morphological characters are described. Artificial infection was obtained on both Chinese varieties of *Gossypium arboreum* and American varieties of *G. hirsutum.* Soaking the seeds in conidial suspensions of the fungus resulted in a high percentage of diseased seedlings, and lesions on the cotyledons, young stems and leaves, and detached bolls were induced by spraying with such suspension. Fruits of pepper, tomato, and eggplant and pods of soybean and cowpea were also experimentally infected, but no plant included in these tests proved susceptible as seedlings. No ascigerous stage was found. The fungus overwinters chiefly inside the infected seeds and possibly also in the affected plant tissues left in the field. Fairly high temperatures combined with high humidity favor development of the disease.

Rhizoctonia leaf spot of cotton, D. C. Neal. (U. S. D. A. coop. La. Expt. Sta.). (*Phythopathology, 34 (1944), No. 6, pp. 599–602, illus. 2*).—A leaf spot of cotton, hitherto unreported and proved due to a *Rhizoctonia,* occurred at Baton Rouge, La., during the summer of 1943. It developed in mid-July on the Deltapine, Coker, and Delfos varieties, producing distinctive symptoms. Culture studies indicate that the pathogen is probably identical with the common soil fungus *R. solani* (*Corticium solani*), but the exact manner of its dissemination to the leaves is unknown. Though the disease caused some shedding, it has not yet been found of serious economic importance.

Peanut seed treatment pays, L. Shaw (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 2, pp. 7, 9, illus. 1*).—Treating peanut seed to assure and improve stands was recommended by the station for the first time in 1943, recommendations being based on the results of experimental work done largely in North Carolina and Georgia during the past few years. This note briefly summarizes procedures and the satisfactory results obtained.

Looking to 1944's potatoes, L. W. Nielsen (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 1, pp. 1–4, illus. 3*).—Consideration of the disease problems that developed in 1943 and suggestions for reducing their seriousness in the future are given in this paper, which takes up southern bacterial wilt, southern root rot, bacterial soft rot, mechanical injury, and temperature, as well as sunscald or heat injury leading to soft rot, and a brief summary of the weather of 1943 in relation to potato disorders.

Hot water for the control of potato ring rot bacteria on the cutting knife, G. H. STARR. (Wyo. Expt. Sta.). (*Amer. Potato Jour., 21 (1944), No. 6, pp. 161–163*).—Boiling water proved effective in killing ring rot bacteria on the cutting knife at exposures of 10 sec.; 5 sec. were not long enough. Temperatures below the boiling point were not as effective, and the resulting percentages of ring rot increased with the lower temperatures until at 150° F. no degree of control resulted. The time element was found important, particularly where rotary knives were used, as the period between the successive seed pieces cut is very short. Consequently, water should be kept at the boiling point for best control. In these trials with use of a hot knife, no reduction in stand or vigor of resulting plants was observed.

Anatomical and cytological studies on beet mosaic, K. ESAU. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 3, pp. 95–117, illus. 13*).—Mosaicked sugar-beet leaves with systemic symptoms from plants inoculated in the greenhouse and from those spontaneously infected in the field showed no abnormalities in the phloem, which was not degenerated and contained no foreign or abnormal bodies. The yellow areas of the leaves tended to be thinner than the green areas and showed certain juvenile characteristics, their cells being nearly isodiametric and rather closely packed. Early in development the yellow areas exhibited scanty cell divisions, at first having larger cells and appearing more mature than the small-celled green areas in which divisions were still continuing. The green areas resembled healthy mesophyll or appeared hyperplastic. Chloroplasts in the yellow area were either pale and fragile, readily swelling and disintegrating on contact with tap water; or they were diffuse and irregularly shaped and stained lightly. In the most severely diseased cells the chloroplasts fused into amorphous masses; nuclei may be absent from such cells. According to the literature (66 references), similar degenerative changes occur in plastids exposed to various injurious agents. Apparently they are symptoms of physiologic disturbances induced within the diseased cells by the presence of the virus but not necessarily responses to any specific action of the virus.

Disease testing and initial seedling selection work at the Houma Station during 1943, E. V. ABBOTT and E. M. SUMMERS. (U. S. D. A.). (*Sugar Bul., 22 (1944), No. 18, pp. 144–148*).—Testing of new seedling varieties of sugarcane for disease resistance and adaptability to Louisiana conditions was continued (E. S. R., 90, p. 492) on a large scale during 1943; approximately 13,000 seedlings from the 1942 breeding season were germinated from true seed received from the cane breeder, and nearly 10,000 of them survived the mosaic inoculation test in the greenhouse and were planted in the field. An additional 500 varieties were received as cuttings from the Canal Point Station. A summary of the numbers studied in different categories is presented, and consideration is given to the progress made and the problems involved, unreleased test field varieties and imported varieties, and to the occurrence of mosaic in resistant released varieties.

Report on cooperative tests with the hot water treatment of sugarcane, department of plant pathology, P. H. DUNCKELMAN and C. W. EDGERTON (*Sugar Bul., 22 (1944), No. 18, pp. 140–144*).—The results of the 3-yr. tests reported confirm past experience in that greater sugarcane yields were obtained from treating the seed cane for 20 min. in water at 52° C. By way of summation of the results on tonnage of first-year stubble of C. P. 29–320 at seven locations during 1941–43, in the August plantings the treated plats averaged 1.4 tons per acre more than the non-treated, in the September plantings 1.58, in the October-treated plats 0.63, and in the November-treated plats 2.95 tons more. In plant cane, increases of 0.96, 3.54, 3.44, and 4.38 tons per acre were produced by treatment from the August-November plantings, respectively. Other varieties showing comparable increases from the treatment included C. P. 28–19 and C. P. 29–103.

The role of red rot in the windrowing for seed of present day sugarcane varieties in Louisiana, I. L. Forbes, P. J. Mills, and P. H. Dunckelman (*Sugar Bul., 22 (1944), No. 18, pp. 148–149*).—In one test with nine C. P. and two Co. varieties, C. P. Nos. 29–120, 33–310, and 29–103 were almost perfect windrowing canes for seed purposes; also C. P. Nos. 36–105 (unreleased), 29–116, 33–425, and 29–320 windrowed satisfactorily, but C. P. 33–243 and 34–120 rated susceptible and moderately susceptible, respectively, to red rot. Co. Nos. 290 and 281 were definitely not windrowing canes for seed purposes.

Electrophoretic studies with plant viruses.—I, Tobacco mosaic virus, V. L. Frampton and W. N. Takahashi. (Cornell Univ.). (*Arch. Biochem., 4 (1944), No. 2, pp. 249–253, illus. 3*).—The Longsworth scanning patterns obtained with extracts from healthy tobacco leaves at pH 7.5 indicate three protein components. The composition of the extracts from healthy leaves was not affected by age of plants up to 3 mo. An additional component appeared in extracts of tobacco plants infected with tobacco mosaic virus, and its appearance was correlated in time with the appearance of symptoms; this additional component is believed to be the virus. The development of the disease did not appear to effect any change in the nature or concentration of the normal proteins.

The size and shape of tobacco mosaic virus particles, M. A. Lauffer (*Jour. Amer. Chem. Soc., 66 (1944), No. 7, pp. 1188–1194, illus. 4*).—Two essentially monodisperse preparations of tobacco mosaic virus were found to have intrinsic viscosities of 39.0, sedimentation constants corrected to water at 20° of about 185 Svedberg units, and one was found to have a diffusion constant corrected to water at 20° of 5.3×10^{-8} cm.^{2}/sec. The partial specific volume determined on two chemically purified preparations was 0.73. The size and shape of the predominating particles were calculated from combinations of these constants. The results of all possible combinations were in excellent agreement and in accord with direct measurements from an electron micrograph. A partially aggregated preparation of virus had a bimodal distribution of particle sizes, as determined from an electron micrograph, an intrinsic viscosity of 80.7, and two boundaries in the ultracentrifuge with sedimentation constants of 187 and 216 Svedberg units. Sedimentation, viscosity, and electron micrograph data were mutually consistent when interpreted in terms of the theories examined. A highly aggregated virus preparation was found to have a very high sedimentation rate and intrinsic viscosity. The excellent agreement found between the results of indirect physicochemical procedures and direct observation with the electron microscope affords strong evidence of the reliability of the methods of determining the size and shape of particles within the colloidal range based on combinations of viscosity and sedimentation, viscosity and diffusion, and sedimentation and diffusion studies.

The influence of concentration upon the sedimentation rate of tobacco mosaic virus, M. A. Lauffer (*Jour. Amer. Chem. Soc., 66 (1944), No. 7, pp. 1195–1201, illus. 1*).—The reciprocal of the sedimentation constant, corrected in the usual manner, of tobacco mosaic virus preparations proved to be a linear function of virus concentration. When the sedimentation rate was corrected for the viscosity of the virus solution instead of for that of the solvent, this dependence on concentration largely vanished. There remained a small residual effect in the opposite direction which may be interpreted as due to nonideality of the solution. Data from the literature on the sedimentation of various polymers and macromolecules show that this close relationship between the apparent concentration dependence of sedimentation rate and solution viscosity is fairly general. Data from the literature on the diffusion of simple electrolytes also support the conclusion that solution viscosity rather than solvent viscosity should be considered in physical studies of this type.

Intracellular inclusions in tobacco mosaic-infected Nicotiana glutinosa and its hybrids, M. W. Woods, (Md. Expt. Sta.). (*Phytopathology, 34 (1944), No. 7, pp. 694–696*).—*Marmor tabaci* induces formation of both crystalline and amorphous inclusions in cells of suscepts which develop systemic chloric symptoms following infection; such inclusions have not hitherto been reported in suscepts which respond to infection necrotically. Because of the etiologic significance of these inclusions it is of interest to know whether their formation can be induced in necrotic-type suscept species. The experiments reported prove that under certain environal conditions hexagonal crystals and "X-bodies" typical of tobacco mosaic can form in mosaic-infected cells of *N. glutinosa* and certain of its necrotizing hybrids. Previous studies (E. S. R., 83, p. 210) have shown that virus multiplication depends on the functioning of a CN-sensitive respiratory system. The factors of high humidity, increased CO_2 concentration, and darkness (modified gas exchange through the stomata) employed in this study might similarly interact to modify the development of tobacco mosaic symptoms from complete necrosis without formation of intracellular inclusions to a less severe breakdown of the tissues. The formation of hexagonal crystals and X-bodies seems to be associated with this lessening of the necrotic action of the virus on the cells.

The effect of formaldehyde and mercuric chloride on tobacco mosaic virus, B. Kassanis and A. Kleczkowski (*Biochem. Jour., 38 (1944) No. 1, pp. 20–24*).—This virus was inactivated by 2 percent formaldehyde at pH 3–7.5; the rate was minimum at pH 3.5. Inactivation could be stopped at any stage by dilution or dialysis, but there was no evidence that inactivated virus regained infectivity by such treatments. Loss of infectivity by formaldehyde does not depend on changes in groups giving the Van Slyke test for amino N, since preparations inactivated by formaldehyde at pH 3 gave the same value as control virus. Treatment at pH near 7 led to a greater fall in the Folin pH 8 color value than treatment at pH 3; there was no real correlation between the decrease in infectivity and in the color value. In sufficient concentrations, $HgCl_2$ acted as an inhibitor of infectivity, causing at pH values greater than 6 loss of infectivity and serological activity. Dilution, acidification, or addition of certain salts prevented inactivation or interrupted its progress at any stage, but there was no evidence that any of these treatments could reverse it.

De las enfermedades de las hortalizas [Diseases of vegetables], L. A. Alvarez García (*Agr. Expt. [Puerto Rico Univ. Sta.], 3 (1943), No. 4, pp. 2–4*).—On diseases of garden crops and their control, including seed treatment and diseases active in the seedbed.

A monographic study of bean diseases and methods for their control, L. L. Harter and W. J. Zaumeyer (*U. S. Dept. Agr., Tech. Bul. 868 (1944), pp. 160, illus. 33*).—The authors have endeavored to discuss all the parasitic and nonparasitic diseases of common (*Phaseolus vulgaris*) and lima (*P. lunatus* f. *macrocarpus*) beans. The bulletin reviews a large amount of investigation by others, as well as many hitherto unpublished results obtained by the authors. There are six major headings of subject-matter, viz, field diseases of snap and dry beans, including a total of 61 diseases; field diseases of lima beans, 11 being described; miscellaneous fungi and bacteria not known to cause diseases but listed as merely occurring on these hosts; transit and market diseases, comprising 15 organisms known to cause some type of decay in transit or on the market; control of transit and market diseases; and inheritance of disease resistance and of certain abnormalities, the mode of inheritance of beans to 10 different diseases and disorders being treated under this topic. There are 579 references.

Association of Xanthomonas phaseoli and the common bean-mosaic virus, Marmor phaseoli.—I, Effect on pathogenicity of the seed-borne infective agents, F. Hedges. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 7, pp. 662–693, illus.*

2).—These studies were undertaken to determine (1) whether mutual or unilateral antagonism or stimulation resulted from the in vivo association of the two seed-borne infective agents, *X. phaseoli* and the virus of the common bean mosaic *M. phaseoli* (bean virus 1), and (2) the application of any such interaction to the problems of breeding for disease resistance. The expressed juice of mosaic-infected trifoliate leaves of *Phaseolus vulgaris* used by an associate in testing a bean hybrid for mosaic resistance produced widespread typical *X. phaseoli* lesions on the rubbed primary leaves. Virulent *X. phaseoli* and a less pathogenic yellow variant were found to be masked in trifoliate bean leaves showing only symptoms of typical common bean mosaic. It was observed further that *X. phaseoli* may be masked in either mosaic-susceptible or mosaic-immune bean varieties. Mosaic-infected trifoliate leaves, used customarily as bean virus 1 inoculum, were not infrequently symptomless carriers of *X. phaseoli*. In one test bean mosaic virus apparently persisted in cultures of *X. phaseoli* on steamed potato for as long as 6 weeks and in those of *X. phaseoli* variant for 11 days. With the possible exception of four isolates from the serial passages, no evidence of such persistence of the virus in culture was detected in other more extensive trials. In the long-continued in vivo association of the two seed-borne pathogens in serial transfers from bean plant to bean plant, there occurred a decrease in the pathogenicity of the bacterium and a more or less steady increase in that of the virus to the point of extreme intensity, and individual variation in mosaic resistance was no longer manifest. Variants of *X. phaseoli* differing in colony type and in virulence appeared in reisolation plates from bean plants inoculated with a combination of the bacterium and the mosaic virus. It is suggested that the virus influenced the tendency of the bacterium to dissociate. The changes occurring in the bacterium during serial passages were further demonstrated by dissociation studies to be reported later. There are 38 references.

Comparative studies of two carrot leaf diseases, W. J. Hooker. (Univ. Wis.). (*Phytopathology, 34 (1944), No. 6, pp. 606–612, illus. 2*).—In Wisconsin the carrot leaf blight caused by *Cercospora carotae* becomes prominent during July and early August; the disease due to *Macrosporium carotae* develops in severity during the latter part of August and in September. Similar temperature responses of the two fungi under controlled conditions in culture consisted of optima for spore germination and mycelial development at 28° C., retardation of growth processes at 16°, slow germination at 4°, and inhibition of mycelial development at 37°. Development of both diseases on seedling carrot leaves in the greenhouse was significantly greater at 24° and 28° than at 16° and 20°; differences between 16° and 20°, as well as between 24° and 28°, were not significant. It is concluded that the temperature responses of the two fungi are very similar. Leaf age, however, was observed to influence pathogenesis of the fungi markedly, *M. carotae* showing a definite preference for the old leaves and *C. carotae* developing in greatest severity on the young leaves. This striking difference in disease development from these fungi on leaves of various ages is believed to be associated with the differences in seasonal distribution of the two diseases.

El manchado tardío del apio (Apium graveolens L.) [Late blight of celery], B. F. Osorio Tafall and A. Meléndez (*Fitófilo, 2 (1943), No. 6, pp. 95–112, illus. 8*).—On celery late blight due to *Septoria apii-graveolentis*.

Celery without blight, K. Kikuta. (Hawaii Expt. Sta.). (*Hawaii Farm and Home, 6 (1943), No. 10, pp. 28–29, illus. 3*).—The previous abstract (E. S. R., 90, p. 782) should read: "Experiments in Hawaii during the winter of 1942–43 are said to warrant the assertion that *Cercospora* early blight and *Septoria* late blights can be adequately controlled by spraying with either Yellow Cuprocide or 4–4–50 bordeaux and that when coupled with good culture practices excellent quality celery can be produced."

Controlling damping-off and other losses in celery seedbeds, G. R. Townsend (*Florida Sta Bul 397 (1944), pp. 27, illus. 5*).—Many fungicides have been tested out against *Rhizoctonia* damping-off in celery seedbeds at the Everglades station, 1936–43. In the course of this work much was learned about this disease and other losses in seedbeds on peat soils; on the basis of the findings, definite recommendations are made. Damping-off was most effectively controlled by applying certain fungicidal dusts or sprays to the beds at frequent intervals during the period of greatest activity of the fungus. Materials found safe and effective include Fermate, Thiosan, Cuprocide, and Spergon; in all cases it is important that the fungicide reach the soil. Early blight may be controlled in the seedbed by the methods for damping-off; for late blight, the hot-water seed treatment should be used. Brief notes on insects and other diseases are included.

Reaction of Lactuca species to the aster yellows virus under field conditions, R. C. Thompson. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 3, pp. 119–125*).—Tested under field conditions for their reactions to the aster yellows virus, all 200 varieties and strains of cultivated lettuce indicated susceptibility; the 22 wild species and strains of *Lactuca* varied greatly in susceptibility. *L. tatarica, L. bourgaei,* and *L. marschallii* seemed to be immune, but they have no direct value in breeding for resistance, having been found genetically incompatible with the cultivated varieties. Two strains each of *L. serriola* and *L. saligna* showed marked ability to escape infection and may prove of value in breeding for resistance—especially the *L. serriola* forms, which cross readily with cultivated lettuce. The 17-chromosome species (*L. canadensis, L. spicata, L. graminifolia,* and *L. floridana*) as a group indicated some ability to escape infection, but they offer no promise in breeding for resistance, having been found genetically incompatible with the cultivated form. *L. virosa* and *L. squarrosa* (*L. laciniata*) are highly susceptible, as indicated by a consistently high percentage of infected plants.

The control of Phytophthora fruit rot on tomatoes, G. L. McNew (*Canner, 98 (1944), No. 24, pp. 15–16, 18, 32, 34, illus. 3*).—A general discussion, based on experimental work, of the rot due to *P. infestans,* including its appearance, factors involved in sporadic epidemics, the value of crop rotation, and the relative effectiveness of different spray materials. In the tests reported, complete and economically profitable control was obtained by copper sprays. A suggested program starts with some insoluble copper compound, such as copper oxychloride sulfate about July 20; bordeaux (4–2–50) can probably be substituted after August 1. Four applications at 10–12-day intervals appeared adequate for effective control.

Little leaf in deciduous fruit trees and vines, H. K. Kemp and J. A. Beare (*Jour. Dept. Agr. So. Austral., 47 (1944), No. 11, pp. 470–479, illus. 12*).—Little leaf of deciduous fruits is said to be a dominant disorder in certain South Australian centers, where it is believed to have been one of the prime factors in the abandonment of orchard cultivation in some areas. This paper discusses its occurrence in this region, the symptoms on pome and stone fruit trees, and the order of susceptibility of fruit varieties, including grapes. Experimental work on control is summarized, with recommendations for spray treatments with $ZnSO_4$ on peach, apricot, pear, apple, and grape.

Principales plagas del manzano en la región en Canatlán, Dgo. [Principal diseases and insect pests of apple in the Canatlán region, Durango, Mexico], L. H. Robles Gutiérrez (*Fitófilo, 2 (1943), No. 6, pp. 3–30, illus. 4*).

The use of Fermate for the control of bitter rot and cedar rust of apple, A. H. Teske and Q. Zielinski. (Va. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 107–108*).—Under the Virginia conditions of the test reported, Fermate gave almost perfect control of cedar rust on the four apple varieties used, and only 2 percent of bitter rot developed on a variety as susceptible as Albemarle Pippin.

A survey of the scab resistance of the foliage on seedlings in selected apple progenies, L. F. Hough. (Ill. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 260–272, illus. 3*).—Observations are presented for resistance to scab of foliage on hybrid seedlings, orchard varieties, and crablike forms of apples under conditions of severe spontaneous infection. Several species of *Malus* appeared entirely resistant; of these, *M. floribunda* and *M. atrosanguinea* appeared to be the most resistant to all types of foliage troubles. Among the orchard varieties, Duchess and Jefferis offer the most promise as scab-resistant parents and have already given a few highly resistant seedlings. In crosses among orchard varieties, scab resistance seems to be determined by several cumulative factors. In an F_2 population of 38 trees from the original cross of Rome Beauty × *M. floribunda*, however, very clear-cut segregation was observed, approximating a 1 : 1 ratio for resistance v. susceptibility. A few of the seedlings from this progeny appear promising as resistant parents in spite of their intermediate fruit size, because of their unusually good foliage and tree characters. There are 18 references.

Comparative spray deposits and scab control from Speed Sprayer and single-multiple gun sprayer, D. E. H. Frear, H. J. Miller, and F. N. Fagan. (*Pa. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 129–133*).—The "Speed Sprayer," as used in orchard trials (1943) on two varieties of apples, was compared with the conventional high-pressure equipment; deposits of spray produced by the former were lower on the tops and higher on the bottoms of the trees than those from the high-pressure sprayer. The low spray deposit on the tops was reflected in increased scab incidence on the leaves and fruits of the McIntosh variety, and the amount of commercial packed fruit was lower from the trees treated with the Speed Sprayer. The name "Speed Sprayer" indicates rapid application of material, and the study showed that applications averaged twice as fast with the same amount of labor as by the high-pressure sprayer.

[Pear and prune diseases] (*Wash. State Hort. Assoc. Proc., 39 (1943), pp. 51–57, 59–64*).—The following papers are included: Observations on Certain Pits and Other Blemishes of Pear Fruits, by J. R. Kienholz (pp. 51–57) (U. S. D. A.); and Prune Diseases, by E. C. Blodgett (pp. 59–64) (Idaho Expt. Sta.).

Prune dwarf and the cherry virus complex, E. M. Hildebrand. (Cornell Univ.). (*Science, 100 (1944), No. 2590, pp. 147–148*).—In this preliminary report on studies of the cherry virus complex over a 9-yr. period, it is now indicated that several viruses are present in the sour cherry, and that three strains of prune dwarf virus exist identified with plum, sweet cherry, and sour cherry.

Peach calico, E. C. Blodgett. (Idaho Expt. Sta.). (*Phytopathology, 34 (1944), No. 7, pp. 650–657, illus. 1*).—A variegation of peach leaves on five trees in Idaho was shown by bud inoculation to be of at least two types: One—nontransmissible and regarded as a chimera—is characterized by irregular yellowing in which three rather distinct shades of green are exhibited; the other—called calico, characterized by extensive yellowing and finally producing a papery-white leaf and twig tissue—is transmissible. Affected fruits are shorter, more round, and show creamy white to red patches. Historical facts and transmission tests are reported, and the two types of disease are compared. The possible origin of the virus is discussed.

Dissemination of a peach mosaic, H. Earl Thomas, C. E. Scott, E. E. Wilson, and J. H. Freitag. (Univ. Calif.). (*Phytopathology, 34 (1944), No. 7, pp. 658–661, illus. 1*).—The disease initially referred to as the Winters peach mosaic (E. S. R., 82, p. 640) and here referred to as yellow bud mosaic (*Inops consilii*) is reported from 11 more orchards in the Winters District, Calif. Details of field observations are presented which seem to indicate that the vector has a very limited range of movement, is readily attracted to peach and apricot, distinctly less so to almond (the only other known suscept), and has a tendency to shun the border rows

of peach blocks. Less certain is a seeming preference for low areas in orchards. About 20 insect species tested in 1938 as possible vectors all gave negative results.

Avocado tree decline in relation to soil moisture and drainage in certain California soils, E. R. PARKER and M. B. ROUNDS. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 71–79, illus. 2*).—The results of previous studies (E. S. R., 91, p. 306) were confirmed by the additional evidence here presented. The better condition of the trees in certain orchards where large amounts of free water were removed by tile drains suggested that subsurface drainage may prove beneficial in other cases. In a few orchards, penetration of rain water into the surface soil was reduced with beneficial results to the trees by maintenance of suitable open furrows between the rows to facilitate runoff during heavy rainstorms. Erosion was prevented here by emptying the furrows into concrete drains at the ends of the rows. It would appear desirable for growers to have detailed knowledge of their soil conditions in order more effectively to prevent or alleviate the accumulation of free water in areas where drainage conditions are unsatisfactory; observations made during and immediately after periods of heavy rainfall appear to be particularly helpful.

Virus diseases of cacao in Trinidad, A. F. POSNETTE (*Trop. Agr. [Trinidad], 21 (1944), No. 6, pp. 105–106, illus. 4*).—The author describes the symptoms of two new graft-transmissible virus diseases of cacao in Trinidad—red mottle and vein clearing. They appear to be spread in nature like the swollen-shoot virus on the Gold Coast, there being the same occurrence of groups of infected trees indicating tree-to-tree spread along rows and of individuals or pairs of infected trees showing the formation of new scattered outbreaks.

Types of fumigation injury on citrus, L. J. KLOTZ and D. L. LINDGREN. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 9, pp. 244–245, illus. 13*).—A pictorial presentation of types of fumigation injury to citrus fruits and leaves, with brief accompanying descriptions.

How growers and nurserymen outwitted the psorosis virus, I. C. BIGG. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 9, pp. 254–256*).—Borrowing from the imaginative "Alice in Wonderland," the author, a pleasant fiction for H. S. Fawcett, "treats the subject of psorosis virus in citrus trees with a wide degree of license and nails down some sound facts at the same time."

Effect of rootstocks on lemon decline and yield in two experimental orchards, L. D. BATCHELOR and M. B. ROUNDS. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 9, pp. 242–243, 265–269, illus. 3*).—From two experimental lemon orchards planted in 1927 it has become evident that the rootstocks have strikingly affected the prevalence of lemon tree decline as well as the yields of fruit. This progress report (E. S. R., 81, p. 519) seems timely because one of these experiments is being discontinued. Now that these orchards may be classed as mature and in full bearing, observations are of practical value; these are summarized in detail, with tabulated data. The sweet orange rootstock has continued to be most satisfactory among those used, both as to yields and lower incidence of decline; results with other rootstocks are compared.

Lemon tree decline studies: Effect of rootstocks on lemon decline and yield in two experimental orchards, L. D. BATCHELOR and M. B. ROUNDS. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 7, pp. 6–9, 16, 18, illus. 3*).—Covered essentially from another source (see above).

Enfermedades criptogamicas que atacan las hojas y frutos del cafeto [Cryptogamic diseases attacking leaves and fruits of the coffee tree], J. A. ALVARADO (*Guatemala Dir. Gen. Agr. [Pub.] 779 (1942), 2. ed., pp. 33, illus. 8*).

Anatomical effects of oil spray injury in guayule seedlings, F. T. ADDICOTT (*Phytopathology, 34 (1944), No. 7, pp. 697–699, illus. 2*).—Oil sprays have been

found very efficient in controlling weeds in guayule nurseries and fields; during the development of spraying methods injury to the plants was frequently obtained. Externally, the injury appeared as brownish spots, though the cotyledons were often completely withered by the oil. Signs of injury appear within 30 min. after exposure, showing palisade cells in early stages of collapse. The leaf tissues most affected were those coming into direct contact with the oil—the epidermis and the palisade just within the stomata; the trichomes, however, were rarely affected. The injury was characterized first by collapse and shrinkage of the entire cell and later by a more or less complete cytolysis. Injurious effects appeared to have reached their maximum within 24 hr. after exposure. No indications of the invasion or extension of injuries by micro-organisms were observed.

Magnesium deficiency of tung trees, M. Drosdoff and A. L. Kenworthy. (U. S. D. A. and Univ. Fla.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 1–7, illus. 1*).—The marginal leaf scorch described, which affects a number of tung orchards in the Florida Peninsula, was found due to Mg deficiency. Though the disorder was partially corrected by applications of N and possibly also benefited by gypsum, the outstanding improvement and only complete recovery was effected by soil applications of Epsom salts made annually over a 2-yr. period at the rate of 8 lb. per tree on 10- to 12-year-old trees and 4 lb. per tree for 6- to 8-year-old trees. This conclusion is supported by the fact that leaves from severely affected trees contained 0.05–0.16 percent Mg, whereas those from trees treated with $MgSO_4$ and having little or no scorch contained 0.20–0.35 percent Mg. A deleterious effect of muriate of potash was observed, as was to be expected from studies of Mg deficiency in other fruit trees. Though dolomite was only partially effective in correcting the disorder, its beneficial influence might have been greater if previous applications of muriate of potash had not complicated the results.

Preliminary report on some mosaic diseases of iridaceous plants, F. F. Smith and P. Brierley. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 6, pp. 593–598, illus. 1*).—The symptoms induced by certain virus diseases occurring spontaneously in several iridaceous plants are briefly described. Tigridia mosaic virus was found transmissible by *Aphis gossypii, Macrosiphum lilii,* and *Myzus circumflexus,* but not by sap; gladiolus mosaic virus was transmissible by *M. circumflexus* and *M. persicae,* but not by sap. Virus was transmitted from mottled *Babiana, Ixia, Sparaxis, Streptanthera, Tigridia,* and *Watsonia* to *Tritonia crocata* by *M. persicae.* Cucumber mosaic virus was found naturally occurring in *Sparaxis* hybrids, apparently a new record for the Iridaceae.

Black scale: A disease of Easter lily bulbs, A. G. Plakidas. (La. Expt. Sta.). (*Phytopathology, 34 (1944), No. 6, pp. 556–571, illus. 4*).—A serious disease of Easter lily causing dark brown to black lesions on the bulb scales in the ground is described under the name "black scale." Pathogenicity studies have shown the cause to be a fungus fitting well in the genus *Colletotrichum* and described as *C. lilii* n. sp. The limited tests of chemical treatments of the diseased bulbs or of infested soil tried have all given negative results.

Studies on lily virus diseases: The necrotic-fleck complex in Lilium longiflorum, P. Brierley and F. F. Smith. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 6, pp. 529–555, illus. 11*).—This disease of Easter lilies, together with two milder subtypes, is described as a complex of cucumber mosaic virus and lily-symptomless virus, the latter named *Adelonosus lilii* n. gen. and sp. Lily mottle viruses (tulip virus group) commonly accompany necrotic fleck but are not essential to expression of the fleck symptoms. Of the insects tested, only *Aphis gossypii* transmits necrotic fleck to seeding Easter lilies, but *Macrosiphum solanifolii* and *Myzus persicae* have been found to transmit both cucumber mosaic and lily mottle viruses. *Calochortus* sp., *Colchicum autumnale, Gloriosa rothschildiana,* and *Fritil-*

laria pudica, not previously recorded as susceptible, were experimentally infected with cucumber mosaic virus. No evidence of susceptibility to lily-symptomless virus was found in tests of 56 other species of plants in 40 genera and 9 families, chiefly monocotyledons. This virus is transmitted with difficulty by sap, is not seed-borne, and has a latent period of a few days in the vector. Though similar in vector relations and known host ranges, it failed to protect against lily rosette virus. The distribution and economic significance of necrotic fleck are discussed.

Further observations on rose wilt virus, B. J. Grieve (*Roy. Soc. Victoria, Proc., n. ser., 54 (1942), No. 2, pp. 229–241, illus. 13*).—The external symptoms of the disease are briefly reviewed, and an account is given of the morbid anatomy of infected plants. The results of mechanical transmission and serological tests suggest that the virus is unstable; in a small proportion of cases successful transmission was effected by T-budding. The only effective remedy against spread at the time of writing was the removal and burning of infected plants as soon as symptoms appeared.

Diseases of snapdragons described, P. E. Tilford. (Ohio Expt. Sta.). (*South. Florist and Nurseryman, 57 (1944), No. 12, pp. 11–12*).

Tulip blight controlled by organic sulphurs, C. J. Gould. (West. Wash. and Wash. Expt. Stas.). (*Phytopathology, 34 (1944), No. 7, pp. 703–704*).—Infection by *Botrytis tulipae* has long been prevalent and destructive in the Pacific Northwest. Bordeaux had been previously used in commercial plantings but often caused more damage than the fungus. Spray trials in the 1941–42 bulb season of a considerable number of fungicides, supplemented by further experiments in 1943 with the more promising among them, led to the recommendation of Fermate for trial in commercial fields in 1944—four applications (2–100) at 10-day intervals, beginning as soon as the leaves are 3–4 in. high for most conditions.

Damping-off in broadleaf nurseries of the Great Plains region, E. Wright. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 2, pp. 77–94, illus. 5*).—There is said to be little published information on the causes of damping-off of broadleaf seedlings—in part due to the fact that seedling diseases have been less important in this group than in coniferous nurseries. This paper prseents the results of recent field and laboratory studies in Federal nurseries in the Great Plains, a region in which soil developmental processes and climatic conditions are unusually uniform for an area extending through so many degrees of latitude. About 50 percent of the broadleaf species grown are susceptible to damping-off, four of the most important being the American elm, Siberian elm, black locust, and desert-willow. For susceptible species, the disease mainly assumes two forms—pre-emergence and postemergence damping-off. Sore shin results from stem infection at about ground level in older plants; root rots and top infection of young seedlings are unimportant in this region. The principal damping-off fungi were identified as *Rhizoctonia solani* and *Pythium ultimum; Fusarium* spp. may also occasionally be important. *R. solani* isolates from different broadleaf species are regarded as strains, since culture characteristics did not seem constant enough to justify establishing other species. Of the broadleaf trees tested, black locust appeared most susceptible to *P. ultimum* and desertwillow most so to *R. solani.* Inoculations proved that *P. ultimum* and several strains of *R. solani* are definitely pathogenic to a number of broadleaf species and also to several agronomic plants. *R. solani* inoculations appeared to be more successful in unsterilized than in sterilized soil; the opposite was true for *P. ultimum.* The comparatively wide range of pathogenicity of *R. solani* isolates further justified designating them as strains rather than species. Preliminary tests indicated that *Fusarium* spp. can induce fairly heavy postemergence damping-off in unsterilized inoculated soil but very little pre-emergence loss except in sterilized inoculated soil. The relation of these studies to the control of damping-off of broadleaf species is discussed.

Two American hardwood species of Endoconidiophora described as new, R. W. Davidson. (U. S. D. A.) (*Mycologia, 36 (1944), No. 3, pp. 300–306, illus. 2*).—The common American hardwood-staining species of *Endoconidiophora* previously referred to *E. coerulescens*—a conifer fungus—is shown to be a distinct species and described as *E. virescens* n. sp. Another related species causing gray mold on chestnut oak is described as *E. variospora* n. sp.

Discolorations and decay resulting from increment borings in hardwoods, R. C. Lorenz. (Minn. Expt. Sta.). (*Jour. Forestry, 42 (1944), No. 1, pp. 37–43, illus. 2*).—Foresters commonly make increment borings in trees; in some species, such as northern hardwoods, this results in discolorations, cankers, and decay. The present study indicates that stain, found chemical in origin and not due to microorganisms, invariably develops in wood adjacent to the borings regardless of preventive measures. Cankers are common but not universal. Black locust plugs had no effect on stain but reduced somewhat the incidence of heart rot. The fungi causing heart rots appeared to be species of *Polyporus* and *Pholiota*. The cases of decay believed due to heart-rotting fungi alone are listed as follows: Paper birch none, yellow birch 12 percent in the unplugged and 2 percent in the plugged holes, sugar maple 12 percent in the unplugged and 6 percent in the plugged, and basswood 28 percent in the unplugged and 3 percent in the plugged holes. Two yr. after the holes were bored, fewer plugged than unplugged holes were callused over in basswood and yellow birch; a larger percentage healed in sugar maple than in any other species, only about 5 percent being still open after 2 yr. Cankers around the opening of borer holes usually would preclude healing of the wound and also increase the opportunity for infection by decay fungi. The latter, especially those causing heart rot, would continue to grow and eventually might cause serious daamge to the individual trees.

Distribution of blister-rust cankers on eastern white pine according to age of needle-bearing wood at time of infection, R. R. Hirt. (U. S. D. A. et al.). (*Jour. Forestry, 42 (1944), No. 1, pp. 9–14*).—A study of blister rust infection of eastern white pine under natural outdoor conditions indicated that cankers develop on needle-bearing wood of the current season and on that 1 and 2 yr. old, the majority forming on the wood 1 yr. old at time of exposure. This was true of 3- to 6-year-old pines potted the same season as needle infection occurred, of undisturbed natural reproduction 4–11 yr. old, and also of seven species of 5-needled potted white pines other than *Pinus strobus*. Cankers on needle-bearing wood 2 yr. old at time of infection were the first to become visible in the bark; by fall of the year following that of needle infection these cankers had the appearance and size attained by cankers on current-season and year-old wood about 21 mo. after needle infection. When current-season needles became infected as early as July-August, the majority of the bark cankers were visible the fall of the first year following that of infection; when infection occurred in September, however, the majority of the cankers failed to appear until the second spring, about 20–22 mo. after needle infection. The majority of the cankers resulting from infection of year-old needles during July-September could be seen the fall of the first year after infection, at that time slightly less than half of the cankers from infection of current-season needles being visible.

The findings indicate that in the eastern United States, by use of sample plats of *P. strobus*, the relative amount of infection for any season can be closely approximated by fall of the next year, and accurate conclusions can be drawn by the following spring. The results also suggest that the majority of the bark cankers for a season of infection will be on wood that was 1 yr. old when needle infection occurred; this is important in studying the history of the rust in infection areas. The heavy infection years can be determined by finding the age of the nodal and internodal bark bearing the greatest number of similar-aged cankers; probably those years will

be the ones following the years when the infected bark was formed. Unusual weather or unfavorable sites may cause the older needles to be dropped prematurely and the younger ones to cease growing before they attain average length; such factors will definitely affect the canker pattern and must be taken into account when studying the distribution of cankers according to age of needle-bearing wood at time of needle infection.

The horse-hair fungi, F. J. SEAVER (*Mycologia, 36 (1944), No. 4, pp. 340–342, illus. 1*).—A note on the finding of the horse-hair blight fungus by soldiers on scrub oak in Louisiana. The American material sent for determination consisted of the mycelial stage only but agreed closely with the description of *Marasmius crinis-equi*, the mycelium of which is the common horse-hair blight of Ceylon. Apparently only one previous collection has been reported in continental America.

Ecological significance of the disappearance of eel-grass at Cape Ann, Massachusetts, R. W. DEXTER (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 173–176*).—*Zostera marina* disappeared from this area in 1932, then returned in small isolated clumps and a few seedlings were produced. During 1933–40 the colonies increased annually, growing chiefly from old rhizomes; most of the plants were diseased and neither survived for long nor led to a significant return of the species. This disappearance of eelgrass disrupted an entire biotic community, removing a direct source of food for some aquatic birds and fishes and indirectly affecting many marine invertebrates, which in turn serve as food for other animals. Bare areas were created on shallow subtidal bottoms, and an agent in sedimentation and in retention of shellfish was eliminated. Certain animals declined in abundance or entirely disappeared. The clam and lobster industries suffered severe losses; only one advantage was gained—removal of a hazard to swimmers. It is generally believed that some environal change was partly responsible for the wide and sudden epidemic.

Additional Canadian host records for Heterodera schachtii Schm. and for H. marioni (Cornu) Goodey, A. D. BAKER (*Canad. Ent., 76 (1944), No. 7, p. 152*).—*H. schachtii* is reported on curled dock and *H. marioni* on common burdock.

The root-knot nematode, J. TYLER (*California Sta. Cir. 330, rev. (1944), pp. 30, illus. 7*).—A revision (E. S. R., 71, p. 64).

ECONOMIC ENTOMOLOGY—ZOOLOGY

Talk about wildlife for hunters, fisherman, and nature lovers, R. O. STEVENS (*Raleigh, N. C.: Bynum Ptg. Co., 1944, pp. 229, illus. 98*).—One of the author's aims in writing this book—gathering the material for which was begun in 1939—was to aid in eliminating some of the alleged weaknesses in present wildlife conservation activities. In addition to problems dealing with the administration of wildlife, he mentions and discusses many of the important phases of game and fish management. The parts played by landowners, technical workers, sportsmen, and others each receive their share in the discussion, which centers around such topics as the need and basis for a sound department of wildlife resources, the ownership of wildlife, administration forms and responsibility, protection and law enforcement, wildlife education and research, artificial propagation, small and big game management, management of predators and rodents, waterfowl management, fur bearers and animals of the chase, fire and wildlife, song and insect-eating birds and other nongame animals, conservation of wild plants and fisheries, pollution and drainage, and the values of wildlife. An appendix presents a suggested fish and game administrative code, with summary and comments on the more important principles involved. An index is provided.

Mammals of the Clearwater Mountains, Idaho, R. T. ORR (*Calif. Acad. Sci. Proc., 4. ser., 23 (1943), No. 35, pp. 511–536, illus. 6*).—In addition to the accounts

of the mammalian species, descriptions are presented of the area and of the plant associations of the habitats. This region is one of great biological interest as representing a mixture of Pacific coastal and true Rocky Mountain plants and animals; relatively little of a general nature has been previously published regarding the mammals of the area and even less of a detailed nature concerning its mammalian fauna.

The control of field mice in orchards, E. M. Mills (*Peninsula Hort. Soc.* [*Del.*] *Trans., 57 (1943), pp. 12–13*).

New Aphodius from Texas gopher burrows, O. L. Cartwright. (S. C. Expt. Sta.). (*Ent. News, 55 (1944), Nos. 5, pp. 129–135; 6, pp. 146–150*).—Nine new species of aphodian dung beetles are described, with brief notes on others.

Lepidoptera eaten by bats, S. G. Hodgson (*Entomologist, 77 (1944), No. 971, pp. 62–63*).

Preliminary report on the birds and mammals of Kootenay National Park, British Columbia, J. A. Munro and I. M. Cowan (*Canad. Field Nat., 58 (1944), No. 2, pp. 34–51, illus. 4*).

Distribution of upland game birds in Nebraska, L. L. Mohler (*Nebr. Bird Rev., 12 (1944), No. 1, pp. 1–6, illus. 2*).

The ecology and management of the American woodcock, H. L. Mendall and C. M. Aldous (*Orono: Maine Coop. Wildlife Res. Unit, 1943, pp. 201+, illus 25*). —The American woodcock (*Philohela minor*) is a characteristic game bird of eastern Canada and United States; except in the southwestern part of its range it is found only in limited numbers west of the Mississippi River. This monograph describes the bird and the method of field study here used and considers its systematic position, distribution, and life history—migrations, courtship and mating, nesting, the young woodcock, food and feeding habits, and cover preferences—and its management—censusing, banding, biotic potential, limiting factors, population factors affecting management, and management practices. Adequate closed season and bag limits, establishment of refuges or sanctuaries, and cover improvement are suggested management practices. Improvements in woodcock habitats may be carried out by creating artificial singing grounds and new covers, preserving existing covers, and control of fire. It is believed that the woodcock may be legally hunted and still maintain its existence if sportsmen cooperate and if they are willing to abide by certain necessary restrictions.

Insect food of the western meadowlark, G. F. Knowlton and D. R. Maddock. (Utah Expt. Sta.). (*Great Basin Nat., 4 (1943), No. 3–4, pp. 101–102*).—This study emphasizes the value of the western meadowlark (*Sturnella neglecta*) to agriculture and its help in suppressing range insect pests in Utah; it is based on examinations of the stomach contents of 172 specimens collected in the State (1932–42).

A new cestode from the bob-white, J. D. Webster (*Amer. Micros. Soc. Trans., 63 (1944), No. 1, pp. 44–45, illus. 5*).—*Raillietina* (*Raillietina*) *colinia* n. sp. is described.

Diorchis ralli n. sp., a hymenolepidid cestode from the king rail, A. W. Jones (*Amer. Micros. Soc. Trans., 63 (1944), No. 1, pp. 50–53, illus 4*).

Diorchis reynoldsi n. sp., a hymenolepidid cestode from the shrew, A. W. Jones (*Amer. Micros. Soc. Trans., 63 (1944), No. 1, pp. 46–49, illus. 3*).

Neurilemomas in a family of brook trout, G. A. Young, Jr., and P. Olafson. (Cornell Univ.). (*Amer. Jour. Pathol., 20 (1944), No. 2, pp. 413–419, illus. 7*).—Neurilemomas were found in all of 25 brook trout (*Salvelinus fontinalis*) examined; 23 of them were obtained from a single hatchery and only 1 of 16 fish of 3 other species was affected. The high incidence of this tumor in brook trout of all ages

in this hatchery suggested that the condition may be hereditary. The primary involvement was in the autonomic nervous system.

Entomology for introductory courses, R. MATHESON (*Ithaca, N. Y.: Comstock Pub. Co., 1944, pp. 600+, illus. 501*).—Though structure, both external and internal, is reviewed and illustrated in this textbook of entomology, the main emphasis is on the lives of insects, including their biological aspects and interrelations with other animal and plant life. A glossary, bibliography (16 pages), and subject index are provided.

Um novo meio para montagem de pequenos insetos em lâminas [A new method of mounting insects on slides], N. L. CERQUEIRA (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 1, pp. 37–41; Eng. abs., p. 41*).—The formula of the new medium has as a base resin and copal dissolved in a mixture of alcohol, camphor, turpentine, and eucalyptol; a modification of this solvent by addition of glacial acetic acid is also described for use in preliminary fixation. The new medium is said to have the same permanence as those which it replaces, and at much less cost. Being nonaqueous, it does not foster the growth of molds, and it dries sufficiently slowly to permit dissections. It clears specimens not previously treated with KOH within 24–48 hr., thus making early study possible. The medium does not retract. Its refractive index at 26° C. is 1.467. Mounted material can be dismounted without heating. The medium offers no interference to staining with acid dyes, and it can be used in histological preparations.

Eine Zuchtweise für Fleischfliegen [A breeding method for sarcophagids], G. STEINER (*Zool. Anz., 138 (1942), No. 5–6, pp. 97–106, illus. 3*).—The method described is said to be suitable not only for breeding sarcophagids but also for other flies, including *Musca* spp.

Inter-relations of plants and insects (*Nature [London], 153 (1944), No. 3884, pp. 424–426*).—Brief review of a joint discussion on "The Inter-relations of Plants and Insects—the Place of Both in the Eco-system" between the British Ecological Society and the Royal Entomological Society of London, held on November 12, 1943.

Fungus and bacterial diseases of insects as factors in biological control, H. S. FAWCETT. (Calif. Citrus Expt. Sta.). (*Bot. Rev., 10 (1944), No. 6, pp. 327–348*).—Much attention is being given to entomophagous insects and to finding ways of increasing their efficiency. Greater attention is needed in exploring the possibilities from similar work with various insect-destroying fungi and bacteria, and possibly also with viruses. This is a comprehensive review of the latter subject (90 references).

Notes on entomogenous fungi, T. PETCH (*Brit. Mycol. Soc. Trans., 27 (1944), pt. 1–2, pp. 81–93*).—Nineteen species are considered, of which seven are new.

Biological control as a supplement to chemical control of insect pests, W. E. RIPPER (*Nature [London], 153 (1944), No. 3885, pp. 448–452, illus. 2*).—A brief review of the literature (20 references) and the results of field experiments described attest that chemical control is greatly limited by the development of resistant races of pests through artificial selection caused by the insecticide; it is proposed to overcome this limitation by a combination of chemical and biological control through use of selective insecticides. To demonstrate the latter effect field fumigation of aphid infestations by nicotine vapors in short exposures was used; by this means a kill of 85–99.9 percent of cabbage aphids at temperatures above 60° F. was obtained, while larvae and pupae of coccinellids, syrphids, and of the braconid parasite *Aphidius brassicae* showed no mortality. Cabbage aphids surviving the treatment, whether or not they were more resistant to nicotine, were all killed by predators and parasites immediately or by parasites within 3 weeks after fumigation. As no resistant aphids survived treatment by the selective insecticide plus attack by beneficial insects, any

possibility of segregating a more resistant race was precluded. The search for further selective insecticides and a systematic exploration of the comparative physiology of insect pests would therefore seem to be promising fields for research.

The application of the probit method of toxicity test data adjusted for mortality in the controls, D. J. FINNEY (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 68–74*).—When data from toxicity tests must be adjusted for a mortality rate among untreated controls, three modifications of the usual method of probit analysis need to be considered. The full solution is more laborious than that ordinarily used, as it requires estimating this mortality rate from the whole of the data. When the rate is not high (e. g., up to 20 percent) a satisfactory approximation may be secured by a simple alteration in the weighing cofficients, especially if the precaution is taken of using 2–3 times as many test organisms for controls as for the dosage of poison, thus decreasing the relative value of the information on natural mortality contributed by the treated batches. The modified weighing coefficients are tabulated for values of the natural mortality from 0 to 20 percent. An example of the more complex calculations required for the full maximum likelihood solution is discussed in detail.

The use of toxic polynitro derivatives in pest control.—II, The estimation of dinitro-o-cresol in winter washes, R. F. BATT, H. MARTIN, and R. L. WAIN (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 64–68*).—In carrying these studies further (E. S. R., 88, p. 654), the estimation of dinitro-*o*-cresol in winter washes consisting of petroleum oil, the cresol, and an emulsifier must first involve separation of the cresol from the other constituents present. A method suited to the cases of emulsions compounded with various types of emulsifier failed when sulfite lye was present; this proved due to the action on cresol of reducing sugars in alkaline solution. Avoiding an alkaline extraction until these interfering substances had been effectively removed, led to an alternative method by which it became possible to separate dinitro-*o*-cresol in this type of emulsion; the findings demonstrated that the methods described are satisfactory for its routine estimation in washes of this type.

The value of DDT for the control of potato insects, A. A. GRANOVSKY. (Minn. Expt. Sta.). (*Amer. Potato Jour., 21 (1944), No. 4, pp. 89–91*).—Among 25 experimental dust and spray combinations, several new materials—including DDT—were tried out in factorial experiments in Minnesota (1943). These field tests indicated DDT to be safe for use on potato foliage and to be very efficient in controlling flea beetles in concentrations as low as 1 percent. Good results were also obtained against potato leafhoppers as well as tarnished plant bugs and other mirids. These preliminary field tests showed DDT to be very effective in controlling both mandibulate and haustellate insects in potato fields, and the possibility of its fungicidal value is suggested.

"Mystery insecticide" studies, D. L. LINDGREN, J. P. LADUE, and D. Dow. Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 4, pp. 6–7, 30*).—In the preliminary experiments reported, the percentage kill of all stages of California red scale was increased by adding DDT to either kerosene or mineral seal oil. The kill was most striking with the young scales through their development to the late gray stage; it was not very great for the late gray adult and mature adult female stages. All the results with DDT incorporated in petroleum oil indicated not only a high toxicity to the young stages, but also a marked residual effect on inhibition of settling and development of the young. In further tests in the laboratory it was found that ground cube root incorporated in light oils with DDT gave a high initial kill of all stages of the red scale, with a long residual action to prevent any young of females surviving the treatment from settling and developing. It is hoped that field tests will confirm these results.

The relative resistance of Periplaneta americana and Blattella germanica to pyrethrum spray, E. R. McGovran, J. H. Fales, and P. G. Piquett. (U. S. D. A.). (*Pests, 12 (1944), No. 4, pp. 12–13*).—When a pyrethrum spray containing 5 mg. pyrethrins per cubic centimeter of deodorized kerosene was applied by the pendulum method as a direct spray to the dorsal surface, adult and large nymphs of the German cockroach were knocked down more rapidly than similar stages of the American cockroach, but mortality counts indicated that the former was more resistant to the lethal effect of the spray. Double the deposit applied to the American species caused only slightly higher kills when applied to the German cockroach.

The stability of rotenone in a phenol-oil solution, G. G. Robinson (*Bul. Ent. Res., 35 (1944), No. 1, pp. 1–2*).—The spray solution used consisted of 60 percent medium Shell oil P31, 15 percent peanut oil, and 25 percent xylenol (low temperature tar phenols distilling at 210°–220° C./760 mm.), and contained 1.5 percent pure rotenone; after a year the rotenone therein was fully as toxic as that in a fresh solution.

Rotenone dust and sprays: Loss of rotenone and deguelin from alkaline and acid rotenone dust mixtures and sprays, R. H. Robinson and M. B. Hatch. (Oreg. Expt. Sta.). (*Soap and Sanit. Chem., 20 (1944), No. 4, pp. 125–131.*)—Miscellaneous alkaline, neutral, and acid rotenone dust mixtures were found to lose rotenone very slowly in both moist and dry storage; however, when water was added to an alkaline rotenone dust to produce an optimum condition, rapid decomposition occurred. Rotenone in derris root combined with acid or alkaline diluents in water at spray dilution showed no decomposition within 3 days. It is assumed that for all practical purposes rotenone-bearing roots may be used without fear of decomposition in sprays combined with alkaline spreaders, deposit builders, or other insecticides if applied immediately after preparation. Analyses of dusted leaves indicated that rotenone is lost from both acid and alkaline mixtures at about the same rate.

Classification of tobacco—nicotine-nornicotine method, C. V. Bowen and W. F. Barthel. (U. S. D. A.). (*Indus. and Engin. Chem., 36 (1944), No. 5, pp. 475–477, illus. 2*).—The melting points of the picrates of known mixtures of nicotine and nornicotine showed that the melting point of the steam-volatile alkaloid picrate may be used to classify tobaccos as to alkaloidal content. According to the upper limit of the melting point spread, tobacco is classified as nicotine type (melting point above 211° C.), mixed nicotine-nornicotine type (melting point 198°–211°), and nornicotine type (melting point 198°). Six tobaccos of known nicotine and nornicotine contents, when tested for melting point of mixed picrates, agreed with the above classification.

Da raiz de Tephrosia toxicaria Pers. e do seu aproveitamento no combate ao Tenthecoris bicolor Scott [The root of T. toxicaria and its value in combating T. bicolor], P. Occhioni (*Rodriguésia, 7 (1943), No. 16, pp. 55–61, illus. 5*).—On the insecticidal efficiency of preparations from *T. toxicaria* against this species of leaf bug (Miridae).

Further studies of new spraying equipment, S. L. Hopperstead, M. W. Goodwin, and P. L. Rice. (Del. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 57 (1943), pp. 13–19, illus. 3*).—The further experimental data (E. S. R., 89, p. 237) presented and discussed are in the way of a preliminary report offered because of the need to offset as quickly and to as great an extent as possible the critical shortage of orchard labor; it is believed that adoption of the newer equipment here described would aid materially in solving this labor problem as well as in producing high-quality fruit.

Insecticide and fungicide supplies for 1944, L. S. Hitchner (*N. Y. State Hort. Soc. Proc., 89 (1944), pp. 46–50*).

Primera lista sistemática de insectos relacionados con la Agricultura Nacional [Preliminary systematic list of insects of interest to Uruguayan agriculture], A. RUFFINELLE and C. S. CARBONELL (*Rev. Assoc. Ingen. Agrón.* [*Montevideo*], *16 (1944), No. 1, pp. 13–32; Eng. abs., p. 32*).—This annotated list, arranged by taxonomic groups, includes insects both harmful and useful to agriculture.

A summary of the Mormon cricket (Anabrus simplex) (Tettigoniidae: Orthoptera), I. LARIVERS (*Ent. News, 55 (1944), Nos. 3, pp. 71–77; 4, pp. 97–102*).—Since a considerable fund of information concerning the biologics and economics of the Mormon cricket has accumulated in recent years in widely scattered journals, the author has "thought it expedient to review the essential features of the more important of these papers for the sake of unification and clarity, as well as to add certain hitherto unpublished aspects of the problem." There are 33 references.

Air temperature records as a guide to the date of hatching of the nymphs of Austroicetes cruciata Sauss. (Orthoptera), H. G. ANDREWARTHA (*Bul. Ent. Res., 35 (1944), No. 1, pp. 31–41, illus. 4*).—Most of this paper is concerned with the description of a method of evaluating the influence of temperature, recorded in the field, on the developmental rate of this species of grasshopper. This method was used to estimate the date of hatching of nymphs of *A. cruciata* in South Australia for each of the 51 yr. 1892–1942. It does not give a precise estimate of the rate of development in the field but provides a useful comparison between one year and another with reference to the general earliness or lateness of hatching in the spring.

An unusual egg laying site for the two-striped grasshopper, W. B. Fox (*Canad. Ent., 76 (1944), No. 5, p. 111, illus. 1*).—The two-striped grasshopper was observed ovipositing in exposed piles of wheat left in the grainfields at harvesttime in southern Saskatchewan.

The grasshopper mite Eutrombidium trigonum (Hermann), an important enemy of grasshoppers, H. C. SEVERIN (*South Dakota Sta. Tech. Bul. 3 (1944), pp. 35, illus. 19*).—The larva of *E. trigonum* is parasitic on grasshoppers, while both nymphs and adults feed on grasshopper eggs. Under South Dakota conditions one complete and a partial second generation occur annually. Adults or nymphs overwinter. An average of about 4,700 eggs are laid by each female. The eggs hatch after a period of 2 to 4 weeks into six-legged larval mites, which become attached to the body or appendages of grasshoppers where they remain for 8 to 14 days. After engorgement with blood the larvae drop to the soil and pupate. After a 7–18-day period eight-legged nymphs emerge. These nymphs suck the liquid from grasshopper eggs, and after about a month transform into the preimaginal pupa in the soil. Adults emerge after a 2-week period. These studies indicate that the feeding by nymphs and adults on grasshopper eggs is of much more importance in reducing grasshopper numbers than is caused by larvae attaching to grasshoppers. According to the author, even though grasshopper mites have been credited with actual control of grasshopper outbreaks in some sections of the United States, such conditions have not been observed in South Dakota. This mite is present, however, each year in some sections of the State, and during favorable years serves as one of the important checks on grasshoppers.

Eriophyid studies, XIV, H. H. KEIFER (*Calif. Dept. Agr. Bul., 33 (1944), No. 1, pp. 18–38, illus. 14*).—This installment (E. S. R., 90, p. 660) contains the descriptions of 10 new species of eriophyid mites, including a pest of persimmon and one of cypress, and a group and generic revision of the family. Keys to the subfamilies and genera are provided.

A revision of the American spider parasites of the genera Ogcodes and Acrocera (Diptera: Acroceridae), C. W. SABROSKY. (Mich. Expt. Sta.). (*Amer. Midland Nat., 31 (1944), No. 2, pp. 385–413, illus. 8*).—"In attempting to

determine specimens of Acroceridae (Cyrtidae) or small-headed flies in connection with a projected List of the Diptera of Michigan, the [author] found it practically impossible to name his material satisfactorily with the existing literature. An investigation of the problem revealed a number of interesting points on the classification of these flies, particularly in the genera *Acrocera* and *Ogcodes*. Further study of important materials and types resulted in the conclusions here presented. The paper is based on a total of 157 specimens of *Ogcodes* and 57 of *Acrocera*." Identification keys are included.

A generic synopsis of the Ceratopogonidae (Heleidae) of the Americas, a bibliography, and a list of the North American species, O. A. JOHANNSEN. (Cornell Univ.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 763–791, illus. 71*). —Includes a key to the North and South American genera of this dipterous group.

Two new species of American Ceratopogonidae (Diptera), O. A. JOHANNSEN. (Cornell Univ.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 761–762*).

Undescribed species of western Nearctic Tipulidae (Diptera), I, C. P. ALEXANDER. (Mass. State Col.). (*Great Basin Nat., 4 (1943), No. 3–4, pp. 89–100*).—New species of crane flies—four of *Limnophila* and three of *Hexatoma* (tribe Hexatomini)—are described from the western United States.

The genus Solubea (Heteroptera: Pentatomidae), R. I. SAILER. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 5, pp. 105–127, illus. 15*).—In this taxonomic contribution on the stinkbug group, the genus and nine species thereunder are considered, new nomenclature being involved in five. Keys to the genus and species are provided.

A new genus, Artucephalus, and a new species of Mexican leafhopper (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 654–655, illus. 1*).

Studies of the genus Empoasca (Homoptera: Cicadellidae).—XI, Six new species of Empoasca from Mexico, R. H. DAVIDSON and D. M. DELONG. (Ohio State Univ.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 636–640, illus. 1*).—A continuation of the series previously noted (E. S. R., 90, p. 364).

A new genus—Hebenarus—and thirteen new species of leafhoppers closely related to Cloanthanus (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Pan-Pacific Ent., 20 (1944), No. 2, pp. 41–53, illus. 2*).—In working over Mexican collections of leafhoppers belonging to the *Platymetopius* groups, a number of species did not seem to belong to any of the described genera; a series of 13 of these rather closely related forms have therefore been separated out and are here described as new species under the new genus *Hebenarus*.

Some new Mexican species of Omanana (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Ent. News, 55 (1944), No. 6, pp. 151–158, illus. 7*).—Six new species are described.

On some Cuban Psyllidae (Homoptera), L. D. TUTHILL. (Iowa State Col.). (*Ent. News, 55 (1944), No. 4, pp. 93–96, illus. 6*).—A note on four species of psyllids, two of which are described as new species and all as new records for Cuba.

The Mexican species of leafhoppers of the genus Texananus (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.) (*Jour. Wash. Acad. Sci., 34 (1944), No. 7, pp. 228–239, illus. 5*).—This contribution brings the total to 27 species of the genus taken in Mexico; 6 of them are here described as new and 19 of them are known only from Mexico. In comparison, 20 species of *Texananus* are known to occur only in the United States and 8 are found in both countries. Besides the 6 new species, 3 male allotypes are described, 1 species is placed in synonymy, and many new records are cited of geographical and altitudinal distributions.

Host plant records of western Lygus (Hemiptera: Miridae), R. L. USINGER. (Univ. Calif.). (*Pan-Pacific Ent., 20 (1944), No. 2, p. 78*).—Host records for seven species of this group of leaf bugs are presented.

Triatomídeos do Chile [The Triatomas of Chile], A. Neiva and H. Lent (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 1, pp. 43–75, illus. 10*).—Five species (four illustrated in color) of assassin bugs of the genus *Triatoma* are considered, including synonymy, original and emended descriptions, geographical distribution, and habits. Three of these species have been found spontaneously infested with *Schizotrypanum cruzi,* cause of Chagas' disease. There are 72 references.

Record of Lepidoptera captured at a light trap at New Carlisle, Quebec, in 1941, J. P. Perron (*Sci. Agr., 24 (1944), No. 8, pp. 387–389*).—This list of some of the insects taken is presented as a contribution to the knowledge of the fauna of the region.

The types of hesperioid genera: Further additions and corrections to the Lindsey list, 1925, H. H. Shepard. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 754–760*).—In 1925, A. W. Lindsey published a catalog of 568 hesperioid generic names with data on genotype fixation.[1] The present author in 1931 added 25 names and called attention to several corrections made necessary by new information.[2] In the present list of additions to this group of skippers 63 new names appear.

The white butterfly (Pieris rapae L.), I–III, J. Muggeridge (*New Zeal. Jour. Sci. and Technol., 24 (1942), No. 3A, pp. 107A–129A, illus. 8; 25 (1943), No. 1, Sect. A, pp. 1–18, illus. 8; pp. 18–30, illus. 6*).—The following papers are included:

I. *Its establishment, spread, and control in New Zealand.*—This study refers chiefly to the genus *Pieris,* but deals especially with the imported cabbageworm (*P. rapae*), its world distribution, appearance and spread in New Zealand, host plants, habits, and life history; the effects of temperature on numbers of broods in different parts of New Zealand; and the effects of climate in relation to the distribution of cruciferous crop plants.

II. *Parasites of the butterfly.*—The synonymy, systematics, and biology of European *Apanteles glomeratus* L. is referred to and its introduction and failure to become established in New Zealand is compared with the introduction and establishment of American-bred *A. glomeratus.* The introduction and successful establishment of *Pteromalus puparum* L., its synonymy, biology, and systematics are also considered, along with its effect on the butterfly population and the influences of climatic conditions on both parasite and host. The imported cabbageworm is attacked by a wide range of parasites; an annotated list is presented.

III. *Introduction of parasites, method, and technique.*—Methods and technics for handling imported parasites and for rearing large numbers of butterfly chrysalids and their parasites are presented. The alternate hosts of *A. glomeratus* and *P. puparum* are listed in an appendix.

The genus Thyridia (Lepidoptera: Ithomiinae), W. T. M. Forbes. (Cornell Univ.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 707–716, illus. 18*).—This taxonomic study includes new nomenclature and a key to the species considered.

The present outlook on the gypsy moth problem, R. C. Brown and R. A. Sheals. (U. S. D. A.) (*Jour. Forestry, 42 (1944), No. 6, pp. 393–407, illus. 9*).—Since the gypsy moth apparently cannot be eradicated in this country, it is important to employ practical methods for combating it that will give the most effective results. This paper presents a comprehensive summary of current developments and plans for the future in connection with the control of this pest. Control measures in regions where the insect has become thoroughly established are handled chiefly by the individual States; though the main objective of the Federal program is to prevent its westward spread, it also involves all possible aid to the development and application of more efficient methods for combating the insect wherever it is a problem.

[1] Ann. Ent. Soc. Amer., 18 (1925), No. 1, pp. 75–106.
[2] Ann. Ent. Soc. Amer., 24 (1931), No. 1, pp. 173–176.

Final report on the program for the colonization of the causative agents of the milky disease of Japanese beetle larvae in Delaware, P. L. Rice. (Del. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 57 (1943), pp. 121–124, illus. 1*).—Two previous reports (E. S. R., 89, p. 241) have presented accounts of the accomplishments during 1941–42; this report deals largely with progress made during the final year, 1943, but also summarizes the accomplishments of the 3-yr. program and the future outlook. Results are not altogether conclusive, but beetle larvae have become diseased at many of the points of colonization and the causal bacteria are spreading. Japanese beetles will probably continue to be important for years to come, at least on their favorite host plants, but their destruction should be substantially reduced by the milky disease through a steady annual decline in numbers.

Effect of milky disease on Tiphia parasites of Japanese beetle larvae, R. T. White. (U. S. D. A.). (*Jour. N. Y. Ent. Soc., 51 (1943), No. 3, pp. 213–218*).—From observations in both field and laboratory, it is evident that some of the progeny of *Tiphia* spp. fail to complete their development owing to death of the host from disease but not to the disease directly. When *T. vernalis* is actively ovipositing in May, the soil temperature in the Moorestown, N. J., area rarely exceeds 65° F.—a condition unfavorable to rapid growth of the disease organism; on the other hand, a species such as *T. popilliavora*, which is active the latter part of August when the higher soil temperature is more favorable to the disease, will probably suffer most. It is unlikely that either of these biological agents alone can completely eradicate the host; both will therefore persist in varying degrees. Since present information indicates that *Tiphia* parasites can complete their development on hosts infected with milky disease, it is believed that these two biological agencies are compatible as control factors within the same area; it is also possible that *Tiphia* may even assist in dispersing the spores of the milky disease.

Mexican bean beetle studies in Delaware, 1943, C. B. Huffaker, D. O. Wolfenbarger, H. L. Chada, and P. L. Rice. (Del. Expt. Sta. coop. U. S. D. A.). (*Peninsula Hort. Soc. [Del.] Trans., 57 (1943), pp. 114–118, illus. 2*).—The studies of 1943 consisted largely of field surveys in which planting dates, beetle infestations, foliage injuries, and other factors were considered; in addition, some late-season insecticide tests were made. These are briefly summarized.

Observations on the life history of Trichodes ornatus (Coleoptera: Cleridae), a larval predator in the nests of bees and wasps, E. G. Linsley and J. W. MacSwain. (Univ. Calif.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 589–601, illus. 12*).—*T. ornatus* Say was found normally predaceous in both adult and larval stages. Larval food was normally restricted to the immature stages, especially the prepupae of aculeate Hymenoptera and particularly the bee family Megachilidae. In the absence of insect food, however, the larvae can complete their development on pollen. Larval development includes three feeding and two nonfeeding instars; under certain conditions a sixth instar may occur. The life cycle varies from 1 to 3 or more years. An annotated bibliography of 46 titles is included.

On the classification of neotropical Megachile (Hymenoptera: Megachilidae), T. B. Mitchell. (N. C. State Col.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 656–671, illus. 20*).—After completing publication of the revision of Nearctic Megachile in 1937 (E. S. R., 80, p. 234), the taxonomic study of this group of leafcutter bees was continued with the neotropical species here considered, including new nomenclature and an identification key to the subgenera.

A revision of the genus Gnathopasites (Hymenoptera: Nomadidae), E. G. Linsley. (Univ. Calif.). (*Amer. Ent. Soc. Trans., 69 (1943), No. 4, pp. 141–149, illus. 1*).—Includes new taxonomy.

Conspectus of the genera of Pemphilidine wasps (Hymenoptera: Sphecidae), V. S. L. PATE. (Cornell Univ.). (*Amer. Midland Nat., 31 (1944), No. 2, pp. 329–384*).—A monographic taxonomic study, including an index and identification keys to the genera and subgenera and descriptions of new genera and species. There are 75 bibliographic footnotes.

A list of Iowa ants, W. F. BUREN. (*Iowa State Col. Jour. Sci., 18 (1944), No. 3, pp. 277–312*).—The author presents a copiously annotated list of the ants of Iowa, with keys for identification and descriptions of those involving new taxonomy. There are 28 references.

Studies of wireworm populations.—I, A census of wireworms in pasture, G. SALT and F. S. J. HOLLICK (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 52–64, illus. 7*).—By use of the method developed and here described, complete wireworm populations were obtained from soil samples of three types, two of which provided large homogeneous populations for detailed study while a third gave information as to the seasonal and spatial infestation of fields. These collections indicated that the wireworm populations of English pasture lands average about three times as large as had been commonly supposed—ranging up to 10 million per acre in the top 12 in. of soil. In two pastures studied intensively throughout the year, the wireworm population was found to consist of large numbers of small larvae, decreasing numbers of larger larvae, and comparatively few of the very large ones that have usually been taken to represent the population. Such a composition is shown to be characteristic of wireworm populations under old grass at all seasons and in several fields in different parts of the country. This suggests that in wireworm research it would be desirable to consider the whole population throughout the year, not merely the large larvae during the cropping season.

Notes on the abundance, life-history, and a teratological specimen of Hypnoidus riparius F. (Col.: Elateridae), A. ROEBUCK and S. P. V. BRAY (*Ent. Mo. Mag., 4. ser., 5 (1944), No. 52, p. 73, illus. 2*).—On the larvae (wireworms) of this species in Derbyshire, England.

Alfalfa insects in California, R. F. SMITH and A. E. MICHELBACHER. (Univ. Calif.). (*Calif. Dept. Agr. Bul., 33 (1944), No. 1, pp. 39–52, illus. 13*).—From this study of the insects attacking alfalfa it is deemed apparent that the control of many of them could be improved if more were known of their habits. In part they are controlled by climate, parasitism, disease, and culture methods. It is important that the role of these various factors and the seasonal trends of the pest be determined; with this knowledge available it is believed that further developments in control procedures would be possible. Though chemical methods have been worked out for certain of these insects, such measures are limited both by the costs and by the fact that the insecticides which can be used are now restricted.

The bionomics of the neotropical cornstalk borer Diatraea lineolata Wlk. (Lep.: Pyral.) in Trinidad, B. W. I., D. K. M. KEVAN (*Bul. Ent. Res., 35 (1944), No. 1, pp. 23–30*).

Wheat stem sawfly in flax, C. W. FARSTAD (*Sci. Agr., 24 (1944), No. 8, pp. 383–386, illus. 2*).—As a potential pest of flax, this sawfly is believed to be of little importance. The present study shows that a relatively insignificant number of branches may be severed and, in combination with grasshopper feeding, some breaking may occur. The value of flax as a crop for ridding a field of its sawfly infestation is believed to far outweigh the small economic loss directly attributable to this insect.

Oruga que vacia las cápsulas del lino [A caterpillar attacking flax capsules], M. GRIOT (*Rev. Argentina Agron., 11 (1944), No. 1, pp. 44–57, illus. 11*).—This contribution on the lepidopterous pest *Rachiplusia nu* Guenée considers its geographical distribution and host plants, economic importance, developmental stages, bionomics, and parasites and diseases.

The Mexican bean beetle (Epilachna varivestis Mulsant) does damage in Utah in 1943, V. M. TANNER (*Great Basin Nat., 4 (1943), No. 3–4, p. 61*).—Note on injuries to beans.

Pea aphid control in 1944, H. F. WILSON. (Univ. Wis.). (*Canner, 98 (1944), No. 25, pp. 16–17, 52, illus. 5*).—Recommendations based on experimental work and availability of insecticides are presented.

Differential effects of temperature on the development of the beet leafhopper, F. H. HARRIES. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 3, pp. 127–136, illus. 3*).—Eggs and nymphs of the beet leafhopper were exposed at one temperature for a given length of time and allowed to complete development at a second temperature under laboratory conditions. Observed time was compared with that expected on the basis of time required when the temperature was not changed. Transferring from a higher to lower temperature resulted in completion of development in a shorter time than was expected. Apparently this effect was not due entirely to direct stimulus, since a reverse change between the two temperatures usually resulted in an increase in the time required rather than a decrease. Differences in time necessary for development indicated that the difference in growth rate at two temperatures was less in the earlier part of the embryonic and nymphal periods and greater in the later part than was indicated by average rates at each temperature. Curves obtained when logarithms of the weights were plotted against time appeared to consist of segments of different slope, which indicates that the growth rate differed in the five nymphal instars.

Research on insecticidal control of the sugarcane borer in 1943 by the Houma, Louisiana, laboratory, J. W. INGRAM, E. K. BYNUM, W. E. HALEY, and L. J. CHARPENTIER. (U. S. D. A.). (*Sugar Bul., 22 (1944), No. 15, pp. 115–117*).—Under the conditions of the 1943 tests it was shown that not only the second- (E. S. R., 69, p. 466) but also the first-generation sugarcane borers were as well controlled by airplane as by ground-machine dusting, one nozzle per row gave as good results as two in ground-machine dusting for first-generation borers, and synthetic and natural cryolite gave approximately the same degree of control if applied with equal facility. Judging by the findings since 1937, cryolite dusting is deemed of much value in borer control and should be a common practice. The authors believe, however, that growers should remember that it cannot be expected to pay in fields having low infestations.

Recommendations for the control of the sugarcane borer in Louisiana in 1944 by dusting with cryolite. (La. Expt. Sta. and U. S. D. A.). (*Sugar Bul., 22 (1944), No. 14, pp. 109–110*).

The sugar-cane scale Aulacaspis tegalensis Zehnt., L. A. MOUTIA (*Bul. Ent. Res., 35 (1944), No. 1, pp. 69–77, illus. 6*).—*A. tegalensis* is described; its occurrence, distribution, and bionomics in Mauritius are discussed; and control measures are considered, including data on its natural enemies.

The biology of Hadronotus ajax Girault (Hymenoptera: Scelionidae), a parasite in the eggs of squash-bug (Anasa tristis DeGeer), S. C. SCHELL. (N. C. State Col.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 625–635 illus. 16*).—The female normally deposits a single stalked egg within the host egg; it hatches within 18–20 hr. In the course of development of the embryo, two embryonic membranes are formed—one cellular and the other noncellular and referred to as the hatching membrane. There are three larval instars, each terminated by a molt; the first is teleaform, the second sacciform, and the third hymenopteriform. The construction of a brown parchmentlike cocoon marks the beginning of the prepupal stage; larval life lasts 5–6 days. The pupal stage occupies 9–10 days and is terminated by a molt just preceding emergence; post emergence remnants in the host egg are the cocoon, meconium, and the exuviae of the third-instar larva and of the pupa. The entire life cycle requires 15–16 days. The species can reproduce parthogenetically.

Expressed as the sex factor, the sex ratio is 0.83, or one ♂ to five ♀♀. Attempts at superparasitism were unsuccessful. The percentage of parasitism for August was 23 for 1940 and 42 for 1941. There are at least four generations per season. Each ♀ averages 16 eggs; the calculated biotic potential (ability to multiply in a given time with no environal resistance) was 31,290.

[Insect pests of fruits and their control] (*N. Y. State Hort. Soc. Proc., 89 (1944), pp. 9–17, 144–164, 170–191*).—The following papers are included: Round-up of Insect Control Developments, by P. J. Chapman (pp. 9–17) (N. Y. State Expt. Sta.); Fruit Insect Problems in 1943, by J. A. Evans (pp. 144–156) (Cornell Univ.); The Scurfy Scale and Its Control in the Hudson Valley, by J. L. Brann, Jr. (pp. 157–161); Developments in European Red Mite Control (pp. 162–164) and The Apple Maggot (pp. 186–191), both by R. W. Dean; Evaluation of Codling Moth Insecticides, by J. L. Brann, Jr. (pp. 170–179) (N. Y. State Sta. and U. S. D. A.); and Report of Progress With Dusting for Codling Moth Control, by D. W. Hamilton (pp. 180–185) (U. S. D. A. coop. N. Y. State Sta.).

[Insects of orchard fruits and their control] (*Ohio State Hort. Soc. Proc., 77 (1944), pp. 16–32, 61–67, 73–92, illus. 7*).—The following papers are included: Arsenical Spray Injury to Peaches, by N. F. Childers (pp. 16–21), and Outstanding Spray Results in 1943, by T. H. Parks (pp. 61–67) (both Ohio State Univ.); Biological Aspects of the Plum Curculio Problem on Peach (pp. 22–28) and The Peach Tree Borer (pp. 29–32), both by R. B. Neiswander (Ohio Expt. Sta.); and Codling Moth Experiments in 1942 and 1943, by C. R. Cutright and M. A. Vogel (pp. 73–92).

The fatty materials in diapausing codling moth larvae (Carpocapsa pomonella L.), E. Hastings and J. H. Pepper. (Mont. Expt. Sta.) (*Arch. Biochem., 4 (1944), No. 1, pp. 89–96*).—A general analysis of codling moth larvae in the diapause stage showed them to contain 54 percent moisture; on the dry weight basis, they contained 44.2 percent crude fats and 39.9 percent crude proteins. Constants determined on the crude fats were iodine, thiocyanogen, and saponification number and acid and ester values. The percentage of unsaponifiable matter was also determined. From these data the percentages of glycerides of oleic, linoleic, and the saturated fatty acids were calculated. The above constants were then determined on the total fatty acids and their mean molecular weight was calculated. The saturated and unsaturated fatty acids were separated and their iodine numbers and acid values determined. From these data their mean molecular weights were calculated, as was also the percentage of oleic, linoleic, and linolenic acids in the unsaturated fatty acid fraction. The data were also compared with those obtained from the comparable developmental stage of the beet webworm.

Melittobia (Syntomosphyrum) indicum (Silv.) (Hymenopt.: Chalcidoidea), a parasite of the Queensland fruit fly Strumeta tryoni (Frogg.), N. S. Noble (*Linn. Soc. N. S. Wales, Proc., 67 (1942), pt. 3–4, pp. 269–276*).

One year with the oriental fruit moth, D. B. Mackie (*Calif. Dept. Agr. Bul., 33 (1944), No. 1, pp. 4–17, illus. 3*).—The author presents a summary of the activities relative to this pest since its discovery in California in 1942. These activities involved matters concerning organization, surveys, legislation, quarantines, treatments, eradication, host plants, field observations, research, influence of the war, and Federal cooperation. Insufficient time is believed to have elapsed for a definite statement as to the future behavior of the pest in the State; thus "the department probably will be compelled wherever possible to devote a considerable part of its oriental fruit moth appropriations and effort to a 'holding campaign' to prevent distribution, while the research entomologists develop control methods." As a result of the 1943 surveys in 36 counties, it has become increasingly evident that the moth must be regarded as a permanent resident in California and may be expected gradually to spread throughout the State.

Summer sprays for the European red mite, J. A. Cox. (Va. Expt. Sta.). (*Va. Fruit, 32 (1944), No. 2, pp. 14, 16–18*).—The dormant oil sprays reduce the mite population by killing the overwintering egg stage of this mite, but under favorable conditions the infestation builds up by the following midsummer and severely damages the foliage of fruit trees. Because of this situation foliage sprays have been sought since 1941, and the results of this work are briefly summarized, as well as notes on the control of the white apple leafhopper. The DN insecticides, summer oil, ground derris with oil, and the rotenone preparations gave satisfactory control of the mite on apple. Those of the last group are not now available for orchard use; the DN materials may be safely employed with lead arsenate in the regular cover sprays if the lime, lime-sulfur, and bordeaux are omitted, and in one season's tests they also controlled the white apple leafhopper.

Miscellaneous diaspid scale studies (Homoptera: Coccoidea: Diaspididae), H. L. McKenzie (*Calif. Dept. Agr. Bul., 33 (1944), No. 1, pp. 53–59, illus. 4*).—Descriptions are presented of three new diaspid scale insects, together with morphological details of *Aonidiella eugeniae* (Hempel) and data on the hosts of *Chrysomphalus bifasciculatus* Ferris.

Two apple pests new to Delaware growers, P. L. Rice. (Del. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 57 (1943), pp. 37–41, illus. 2*).—The history, distribution, seasonal history and habits, and control of the pistol casebearer and Comstock mealybug—new pests in Delaware orchards—are summarized.

A new injurious mealy-bug from the Gold Coast, F. Laing (*Bul. Ent. Res., 35 (1944), No. 1, pp. 91–93, illus. 1*).—*Pseudococcus exitiabilis* n. sp. on cacao is described.

The effect of the host fruit upon the scale Aonidiella aurantii Mask. in relation to its parasite Comperiella bifasciata How., H. W. Simmonds (*Jour. Austral. Inst. Agr. Sci., 10 (1944), No. 1, pp. 38–39*).—The experimental figures presented seem to indicate that in some way lemon, in comparison to orange, as a host fruit for the California red scale has an inhibiting effect on the development of its parasite *C. bifasciata.*

Prospects for scale and mealy bug infestations during 1944, W. L. Thompson. (Fla. Expt. Sta.). (*Citrus Indus., 25 (1944), No. 6, pp. 5, 8–9, 18*).—A general discussion of these citrus pests and their control in Florida, with the conclusion that from all indications "heavy infestations of purple scales, red scales, and mealybugs are likely to develop this summer."

Control of citrus thrips, C. O. Persing and L. R. Brown. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 3, pp. 7, 14–17, illus. 1*).—The essential information herein has been noted in the following abstract.

The present status of citrus thrips control, C. A. Persing and L. R. Brown. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 6, pp. 149, 160–161, illus. 1*).—Since in certain California areas thrips have developed racial characteristics resistant to the tartar emetic treatment, tests on lemons with various old and new organics have been made, among which 1 qt. nicotine sulfate (40 percent nicotine) plus 4 lb. sugar to 100 gal. water proved most satisfactory for controlling these resistant races. Tests of equipment have indicated that spray dusters originally designed for tartar emetic can be used for nicotine fungicide by increasing the spray output to apply 1 gal. per tree at a reasonable driving speed. Nicotine-sugar sprays are not as effective as the tartar emetic was before the resistant races had developed. It is suggested that in Kern and Tulare Counties, where tartar emetic is no longer effective, the sulfur dusts and lime-sulfur wettable sulfur sprays are the most satisfactory materials for spring treatment. It is pointed out that insufficient information is available for recommending the nicotine sulfate-sugar spray for thrips control on oranges in these districts.

Orange worms and control, A. M. Boyce, R. B. Korsmeier, and R. C. Dickson. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 5, pp. 8, 22*).—As here used, "orange worms" refer to the larvae of *Holcocera iceryaeella* (Riley), *Platynota stultana* (Wals.), *Pyroderces rileyi* (Wals.), and the orange tortrix, the last being considered the most important pest. The results of recent experiments with cryolite, DN-Dust, DN-Dust D8, and DN-sulfur dust are briefly summarized.

An unusual correlation between insect damage and crop harvested, C. H. Gadd (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 47–51*).—In the experiment described an attempt was made to determine the effects of manurial treatment on the damage caused by the shot-hole borer of tea (*Xyleborus fornicatus* Eichoff subsp. *fornicator* Eggers). Increases in yields of the plats were accompanied by greater damage from the beetles as measured by the number of broken branches—an unusual correlation between pest damage and harvest.

Three aster-feeding coleophorids and their allies (Lepidoptera), J. McDunnough (*Canad. Ent., 76 (1944), No. 5, pp. 104–109, illus. 9*).—Of the five species of *Coleophora* described, four are new.

Forest entomology.—Fifth annual report for the year ending March the 31st, 1942, A. R. Gobeil et al. (*Quebec Dept. Lands and Forests, Contrib. 18 (1943), pp. 15, illus. 1*).—This report concerns the forest insect survey (1940–41), by R. Lambert; the results of inspections of permanent sample plats, plantations, and tree nurseries over a 3-yr. period, by M. E. Genest; and summaries of ecological studies of insects by R. Martineau and of biological control by G. Paquet.

The larch sawfly (Pristiphora erichsonii (Hartig)) in British Columbia, with special reference to the cocoon parasites Mesoleius tenthredinis Morley and Tritneptis klugii (Ratzeburg), G. R. Hopping, H. B. Leech, and C. V. G. Morgan (*Sci. Agr., 24 (1943), No. 2, pp. 53–63, illus. 1*).—The two parasites studied are said to be well distributed over the areas infested by the larch sawfly and to be important control factors. Though there is some conflict between the two owing to hyperparasitism of *M. tenthredinis* by *T. klugii*, this does not appear in most cases to be serious. It is believed advantageous to introduce *M. tenthredinis* into areas where *T. klugii* is already present but the reverse is not recommended until more is known as to the interrelationship of the two. The tachinid *Bessa selecta* Meigen is widespread but not so important as the above two species; predators are less effective than parasites. The fungus *Isaria farinosa* may be valuable under certain moisture conditions. Weather may have been a control factor in 1935. In British Columbia the general indication is that defoliation has been heavy during the first few years after establishment of the sawfly; thereafter, the zones of heavy defoliation have decreased both in number and size. It may be that natural control factors now operating over much of this sawfly area will be able to keep the pest down sufficiently to prevent any lasting damage to the western larch stands.

The spruce budworm in Maine, H. B. Peirson (*Maine Forest Serv. Cir. 5 (1944), pp. [4], illus. 1*).—An informatory leaflet illustrated in color.

Quantitative analyses on the cellulose fermentation by termite protozoa, R. E. Hungate (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 730–739, illus. 2*).—Through use of large Warburg vessels the decomposition of weighed amounts of cellulose by protozoa from termites (*Zootermopsis*) was studied—the protozoa being obtained directly from the termite alimentary tract, washed in a suitable inorganic medium, and allowed to act on cellulose for periods up to 108 hr. The cellulose lost could be recovered to the extent of 70–75 percent as the products of decomposition (CO_2, H, and acids—principally acetic); the possibility that bacteria were concerned in the formation of these products was considered and their action shown to be negligible. Protozoa from different colonies of *Zootermopsis* exhibited differences in their metabolic products and salt requirements, possibly due to differences in the

proportions of the protozoan species present. From the amount of H produced in the faunated termite and from the ratio in which the fermentation products appeared in the in vitro tests a quantitative estimate of the fermentation products formed by the protozoa within the termite was made. These products were sufficient in amount for their oxidation to account for the observed O_2 consumption by the termite. It thus appeared improbable that glucose is absorbed to any great extent.

Symposium on control of insects attacking stored foodstuffs (*Ann. Appl. Biol., 31 (1944), No. 1, pp. 75–88, illus. 2*).—The following papers were presented: The Organization and Work of the Pest Infestation Laboratory of the Department of Scientific and Industrial Research, by G. V. B. Herford (p. 75); Factors Influencing the Course of an Insect Infestation in Bulk Wheat, by T. A. Oxley and R. W. Howe (pp. 76–80); Behaviour of Tyroglyphid Mite Populations in Stored Grain and Flour, by M. E. Solomon (p. 81); The Role of the Chemist in Research on Fumigation, by W. Burns Brown (pp. 81-84); and Control of the Granary Weevil With Finely Ground Mineral Dusts, by E. A. Parkin (pp. 84-88).

The use of carbon dioxide production as a measure of infestation of grain by insects, R. W. Howe and T. A. Oxley (*Bul. Ent. Res., 35 (1944), No. 1, pp. 11–22, illus. 2*).—A technic is described for routine determination of the CO_2 output of samples of grain; its concentration in the intergranular air during incubation for 24 hr. at 25° C. is known as the "carbon dioxide figure" of the sample. A high CO_2 figure indicates that the grain is unsuitable for storage; it is largely a measure of insect infestation, and a table is given by which the numbers of various species of insects common in grain may be estimated from the CO_2 figure.

A preliminary list of the mosquitoes of Indiana, J. W. Hart. (Purdue Univ.). (*Amer. Midland Nat., 31 (1944), No. 2, pp. 414–416*).—Records of specimens collected and/or determined, mostly from light traps, during 1941-42, together with additional material in the Purdue University collection are the basis for this annotated list of 24 species now known from Indiana.

The mosquitoes of Nebraska, H. D. Tate and D. B. Gates (*Nebraska Sta. Res. Bul. 133 (1944), pp. 27, illus. 1*).—Based largely on a collection of about 250,000 mosquitoes obtained from mosquito light traps located in 19 different localities, 33 species representing 8 genera were obtained. Of the total number, 66 percent were *Aedes,* 25 percent *Culex,* and 7 percent *Culiseta. A. vexans* Meig. represented 52 percent of the total catch. Four species of *Anopheles* were collected, namely, *A. walkeri* Theob., *A. punctipennis* Say, *A. quadrimaculatus* Say, and *A. occidentalis* D. & K. In this study *A. quadrimaculatus* did not appear sufficiently abundant over a long enough period of time to be of more than local or temporary importance in disseminating malaria. Biological and ecological notes are included for each species.

Feeding habits of the proven and possible mosquito vectors of western equine and St. Louis encephalitis in the Yakima Valley, Washington, W. C. Reeves and W. M. Hammon (*Amer. Jour. Trop. Med., 24 (1944), No. 2, pp. 131–134*).—A large series of blood-engorged specimens collected in domestic habitats were tested by the precipitin technic to determine the relative proportions which had fed on domestic animal reservoirs of these infections and on man; at the same time, hand collections were made on the horse, cow, and man to determine which of the mosquito species fed on these hosts. *Culex tarsalis,* the species best fitting the epidemiological picture as a mosquito vector in the Yakima Valley, fed frequently on the domestic fowl (a reservoir of encephalitic viruses) and included most of the common domestic animals and man in its feeding range; its feeding habits alone could result in the incidence of encephalitis antibodies demonstrated in domestic animals and man in this area. Species (including *Aedes*) rarely or never found infected in nature appeared to be those feeding almost exclusively on mammalian blood. *C. pipiens* was the exception,

feeding almost entirely on fowl; this species, demonstrated to be capable of transmitting St. Louis virus, is believed also to play an important role for this one virus where it occurs in large numbers. Results of the present findings strongly support the probability that domestic fowl are an important reservoir of infection in the Yakima Valley.

The mosquitoes of the greater Winnipeg area, J. McLintock (*Canad. Ent., 76 (1944), No. 5, pp. 89–104, illus. 3*).—A brief outline is given of the topography, vegetation, and climate of this Canadian region, followed by a description of the methods by which the specimens of mosquitoes were obtained, reared, and identified. The species occurring are grouped according to their importance as pests, and the habitats and times of emergence of each are given as far as known for the area. The 22 species known to occur in the region are listed, and a brief account is given of each.

The Anopheles of Panama, with special reference to hand lens identification and notes on collecting and care of specimens, C. P. Baxter and J. Zetek. (U. S. D. A. et al.). (*Amer. Jour. Trop. Med., 24 (1944), No. 2, pp. 105–123, illus. 7*).—Medical personnel accompanying the armed forces widely scattered over the world make this an unprecedented opportunity for collecting and studying mosquitoes. This paper is intended to aid the man in the field with limited equipment to obtain specimens of eggs, larvae, and adults and be able to make a working identification. Only when identification has been made and habits, preferences, and disease-bearing possibilities have been studied from reference data of known species, or carefully worked out from study of new species, can the mosquito problem be solved. Brief descriptions are included of the 18 known *Anopheles* species of Panama.

Lista dos mosquitos da Bolívia (Diptera: Culicidae), N. L. Cerqueira (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 1, pp. 15–36, illus. 2; Eng. abs., p. 35*).—In material collected by the Bolivian Yellow Fever Service (1933–42), the 126 species of mosquitoes of 15 genera presented in this annotated list were found, all coming from regions where cases of yellow fever had been observed.

Algumas espécies novas da Bolívia, e referência a três espécies de Haemagogus (Diptera: Culicidae) [Some species new to Bolivia and reference to three species of Haemagogus], N. L. Cerqueira (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 1, pp. 1–14, illus. 25; Eng. abs., p. 13*).—During a study of material collected by the Bolivian Yellow Fever Service (1933–42), five new species of mosquitoes were encountered and are here described under the genera *Taeniorhynchus* (*Rhynchotaenia*), *Psorophora,* and *Aedes.* New evidence bearing on certain species of *Haemagogus* is also presented and discussed, including notes on the geographical distribution of three species.

The organization of permanent nation-wide anti-Aedes aegypti measures in Brazil, F. L. Soper, D. B. Wilson, S. Lima, and W. Sá Antunes (*New York: Rockefeller Found., 1943, pp. 137+, illus. 27*).—This report is based on the work of the Cooperative Yellow Fever Service maintained jointly by the Brazilian Government and the International Health Division of The Rockefeller Foundation for 11 yr. (1929–40). Following the historical introduction, the various technics used in the campaign against *A. aegypti* are described in detail. An appendix presents the regulations of the Service for the prevention of yellow fever in Brazil. A bibliography and an index are included.

Observations on the distribution of diurnal mosquitoes in a tropical forest, M. Bates (*Ecology, 25 (1944), No. 2, pp. 159–170, illus. 1*).—*Haemagogus capricornii*—presumed to be the chief vector of jungle yellow fever in eastern Colombia—was found to be relatively more abundant in the forest canopy than at ground level; in the latter case it was more abundant in open dry stations in the forest than in

damp, heavily shaded locations. In stations above the general level of maximum density in the forest canopy it was again relatively scarce. Its zonal distribution was most marked during the wet season, and it became relatively more abundant at ground level toward midday on a clear day, after a succession of clear days, and during the dry season. It would thus appear that avoidance of zones of high relative humidity may be the determining factor in the flight orientation of this mosquito. Each diurnal species found in the forest seemed to have a particular type of flight distribution, some preferring ground levels and some canopy levels, whereas others showed a random distribution. Diurnal mosquitoes also exhibited two types of daily activity, the *Psorophora ferox* type having morning and evening peaks of activity and the *H. capricornii* type being active at midday. In general, the nonmetallic diurnal mosquitoes fly more commonly in the lower strata of the forest and show a decline in activity around midday, the only clear exception to this rule noted being *Aedes boliviensis*. These facts support the theory that metallic coloration in mosquitoes is an adaptation to life under relatively adverse temperature and humidity.

Airplane dusting with paris green for control of Anopheles quadrimaculatus Say in water-chestnut covered areas of the Potomac River during 1943, W. C. MURRAY and H. KNUTSON (*Pub. Health Rpts. [U. S.], 59 (1944), No. 18, pp. 573–583, illus. 6*).—Waterchestnut-covered areas in the Potomac River afforded prolific breeding grounds for the common malaria mosquito. Because of the close proximity of six military establishments, control measures were conducted (1942–43) by the Office of Malaria Control in War Areas of the U. S. Public Health Service; this report deals with the work of 1943. Weekly dustings applied by airplane were made throughout the breeding season, 32,536 acres being treated with 40,277 lb. of paris green. The average cost was $1.20 per acre per application, including all expenditures for supervision, labor, and materials. An indicated over-all control of 96.93 percent of these mosquitoes in the protected areas was shown by weekly inspections at over 100 larval and adult index stations located both inside and outside the control zones. The most important factors in the successful prosecution of the work were the complete organization in advance; coordination between and full utilization of engineering and entomological services; regulation of frequency, rate, and extent of dust application through careful consideration of entomological findings; skillful operation by the airplane pilots; and detailed and close supervision of all phases of the work.

Notes on the construction and use of stable traps for mosquito studies, M. BATES (*Jour. Natl. Malaria Soc., 3 (1944), No. 2, pp. 135–145, illus. 3*).—*Anopheles* mosquitoes with outdoor resting habits are apparently able to escape rather readily from traps with a vertical opening; it was found that those which could not be caught in numbers in stable traps with the ordinary vertical ingress slit could be caught if this ingress were arranged in the horizontal plane so that they would have to fly downward to escape. The catch was also increased if the ingress baffle was made of wire netting stretched taut so that the wooden supports serving to make the opening more conspicuous were not needed. The catch appears to be about the same whether the roof is made of transparent or opaque materials. The possibilities of using stable traps for studies of host preference and of seasonal distribution are discussed, with examples from Colombia and Egypt.

Studies on the ecology of the Levant house fly (Musca domestica vicina Macq.), B. FELDMAN-MUHSAM (*Bul. Ent. Res., 35 (1944), No. 1, pp. 53–67, illus. 5*).

On the development and hatching of the eggs of Hammerschmidtiella diesingi and Leidynema appendiculatum, nematodes of roaches, A. C. TODD. (*Univ. Nebr.*). (*Amer. Micros. Soc. Trans., 63 (1944), No. 1, pp. 54–67, illus. 7*).—In experiments with infective eggs of these two worms hatching percentages as high

as 40 were obtained by treating the eggs with 1 percent peptone followed by 1 percent tryptone solutions. Two molts occurred during the development of each species; the first was outside the host with a resting (infective) stage, whereas the second molt occurred after ingestion of the infective egg by the roach host and before the egg hatched. The anaerobiosis encountered in the roach digestive tract was not considered a factor stimulatory to the completion of the second molt; this did not occur in vitro in the absence of bacterial action. It is believed probable that NH_3 in the digestive tract of the host—apparently arising as a result of the bacteria present—determines at least in part the completion of the second molt and hatching of embryos in infective eggs of these two nematode species. The study indicates a relationship between the intestinal flora of the cockroach and one phase of the life cycle of its nematode parasites.

Synthetic roach powders (*Soap and Sanit. Chem., 20 (1944), No. 5, pp. 102–105, illus. 5*).—On the new nonpoisonous organic thiocyanate, Lethane A–70.

The seasonal history and hosts of the American dog tick (Dermacentor variabilis) in Iowa, G. W. Eddy and C. R. Joyce. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 18 (1944), No. 3, pp. 313–324*).—In the course of these studies (April-December 1941) biweekly examinations of dogs were made to determine the seasonal trend of adult ticks, and mice were live-trapped for data on the seasonal history of young ticks; other animals were also checked at every opportunity. The adults began activity the first week in April. The average number of adult ticks per dog was approximately 40, 89, 28, 10, 0.8, 0.1, and 0.004 for each month, April to October, respectively. The last specimen was taken on October 9; 100 percent of the dogs were infested during April-June. A total of 1,132 dogs were examined; no new host records for adult ticks were obtained, but a number were collected from the horse, pig, cow, fox squirrel, woodchuck, house cat, and raccoon. Data from the mice examined seemed to indicate that the immature stages are inactive during winter in Iowa. A total of 2,656 northern white-footed mice, 92 prairie harvest mice, 19 meadow mice, 2 prairie jumping mice, and 1 house mouse were examined, the first apparently being the most important cricetine on the area. Results showed that the prairie harvest mouse is not a very favorable host; data on the other species were too incomplete for conclusions. Larvae and nymphs were also collected from several other hosts and the detailed data are presented. Some information was obtained on the attachment of the larval and nymphal stages on mice. The percentage infesting various body parts was for the larvae—on the ears 71.07, cheeks 10.08, other head parts 8.49, back and shoulders 5.74, neck 3.60, legs 73, and sides and belly 0.27; and for the nymphs—back and shoulders 36.80, neck 22.67, head (except ears and cheeks) 19.70, cheeks 13.38, ears 6.69, and sides 0.74. In general, the larvae showed a preference for the head, especially the ears, whereas the nymphs tended to congregate about the neck, shoulders, and fore parts of the body. Over 4,394 animals in all were examined, including 266 birds and a number of horses, cattle, and domestic fowl; some small mammals not mentioned above were also examined, but with negative results. There are 26 references.

Multiple mating of queen bees proved by progeny and flight tests, W. C. Roberts. (U. S. D. A. coop. La. State Univ.). (*Gleanings Bee Cult., 72 (1944), No. 6, pp. 255–259, 303, illus. 1*).—During 1939–40 flight data were obtained on 110 marked queens permitted to fly from nuclei during observational periods—55 of them mating twice, the second time usually on the day after the first; 14 single-mated queens made additional flights after mating. The mating flights averaged 15.8 min. and the nonmating ones 10.4 min.; the duration of the mating flights decreased from 19.3 min. in April to 11.9 min. in June, probably because drone populations increased with advance of season. In 1942, 35 yellow queens were allowed free flight at mating stations provided with yellow drones; 8 of them mated only

with yellow drones, 1 mated only with black drones, and 26 mated with both yellow and stray black drones. Comparison of the worker progenies of these naturally mated queens with those of sister queens artificially inseminated—using drones from the drone colonies at the mating station—verified these conclusions. The relative distribution and amount of black and yellow coloration on the abdominal tergites of worker bees were used as criteria to set up a system of color classes. Yellow queens artificially inseminated with sperm from yellow drones produced only yellow workers; when crossed with black drones, only worker progeny of the intermediate class. Sister yellow queens inseminated with sperm from both black and yellow drones produced workers in both yellow and intermediate groups. These findings indicate that multiple matings occur more frequently under natural conditions than was noted during the flight-control observation; multiple matings by queens therefore appear to occur more frequently than single matings. There are 11 references.

Artificial insemination of the queen bee (Apis mellifera L.): Morphological basis and results, H. H. LAIDLAW, JR. (Wis. Expt. Sta.). (*Jour. Morphol., 74 (1944), No. 3, pp. 429–465, illus. 15*).—The reason that breeding and improvement of bees has failed to keep pace with similar studies in plants and other animals lies partly in the peculiarities of reproduction in the bee and in the inability to exercise strict control over individual matings. Some progress has been attained by selection based on isolation of colonies and in management leading to control of the activities of the colony and increased honey production; nevertheless, there is apparently no strain of honeybee which has deviated so far from the wild but that its descendants can reestablish themselves as "wild bees" when opportunity offers. With controlled matings a more direct approach could be made in breeding for prolificness, carrying capacity, longevity, gentleness, disease resistance, lack of swarming tendency, uniformity, and other desirable traits. More recently attention has been centered on artificial insemination. In the present study the morphology of the reproductive tract of the queen is reviewed (32 references) as a basis for insemination technic, and pertinent facts have been added. Examinations of queens immediately on return from the mating flight indicated that in natural mating the semen is received largely into the vagina and oviducts and is plugged in place by the detached penis and mucus from the mucus gland of the drone. It requires some hours for the sperm to pass from the oviducts into the spermatheca where it is stored and used for 2–3 yr. The "valve fold" occludes direct entrance from the vagina into the median oviduct; this proved a serious obstacle in earlier attempts at artificial insemination. In the present work this difficulty was overcome by instruments with which the valve fold may be lowered and held out of the way, allowing for passage of the semen directly from the pipette into the oviducts, whereupon the valve fold is allowed to go back and a plug of mucus is inserted in the vagina and sting chamber to aid in retaining the semen until its passage into the spermatheca. By the technic described, the semen can be injected into the oviducts rapidly and easily without mechanical injury and with sufficient success for experimental application, though the technic is not yet entirely satisfactory. An anesthetic less harmful than ether is needed, and care must be taken that a large mucus mass be employed so as to retain the semen in the reproductive tract for several hours. Suggestions as to profitable directions for further research are offered.

Productive management of honeybee colonies in the Northern States, C. L. FARRAR (*U. S. Dept. Agr. Cir. 702 (1944), pp. 28, illus. 14*).—Fundamentals of productive beekeeping and management practices designed to give maximum production from honeybee colonies are discussed for the experienced beekeeper. Much general information about bees and handling the honey crop is omitted. The trend in beekeeping practice has been toward the extensive operation of more hives on an apiary basis. Because most commercial apiaries show average yields approximately

one-third those obtained from the highest-producing colonies, this circular stresses intensive colony management. The behavior of bees is instinctive and constant regardless of the geographical location. The influence of locality on beekeeping problems is due mainly to differences in pollen and nectar resources and their time and period of bloom. Colonies are highly adaptable to regional differences and climatic changes when they are headed by productive queens and supported by normal populations for the time of year, provided that their hives contain ample food reserves of both pollen and honey and space for the expansion of brood rearing and the storage of surplus honey. Information is also included on pollen and nectar sources, nectar secretion and the honey flow, location and size of apiaries, equipment, selection of stock, and the economics of colony management.

Honeybees and red clover pollination, E. J. Anderson and M. Wood (*Amer. Bee Jour., 84 (1944), No. 5, pp. 156–157, illus. 2*).—The variation in set of seeds on plants caged with bee hives indicated that under the Pennsylvania conditions used honeybees are capable of pollinating red clover and that the set is increased as the activity of the bees is heightened. Field observations showed that the activities of the bees and other insects varied for different hours of the day and for different periods of the season. The amount of work accomplished by individual bees as they visited the blossoms was also studied, counts showing that those gathering nectar visited 30–40 corollas per minute or 2,160 per hour and those gathering pollen, 96–117 per minute or an average of 6,180 per hour. An effort was made to check the amount of nectar secreted by different red clover varieties, and the results are very briefly summarized. The relative weights of nectar solids for different strains continued fairly consistent throughout the season, and the figures are believed to explain in part the reason for the presence of larger numbers of bees on some varieties than on others. The results of the study are believed to offer a challenge for further investigation along the lines of producing a more dependable set of red clover seed in the East and a larger surplus of nectar for the beekeeper.

Protect the bees, G. F. Knowlton. (Utah Expt. Sta.). (*Amer. Bee Jour., 84 (1944), No. 6, p. 195*).—Shortage of bees for fruit tree pollination due to the death of several thousand colonies in Utah during 1943 led to a conference of interested organizations; as a result, certain recommendations are here presented for the protection of honeybees from poisoning by agricultural sprays and dusts.

DDT poisonous to honeybees, V. G. Milum. (Univ. Ill.). (*Amer. Bee Jour., 84 (1944), No. 6, pp. 194–195*).

ANIMAL PRODUCTION

Feeds and feeding: A handbook for the student and stockman, F. B. Morrison (*Ithaca, N. Y.: Morrison Pub. Co., 1944, 20. ed., pp. 1050+, illus. 204*).—A reprint with minor changes (E. S. R., 77, p. 77).

Composition of range grasses and browse at varying stages of maturity, W. E. Watkins (*New Mexico Sta. Bul. 311 (1943), pp. 43, illus. 11*).—Analyses and evaluations were made of 712 samples of 14 different species of range forage plants taken at approximately monthly intervals over a period of about 5½ yr. Protein losses of 37–73 percent occurred between October and March. There was one winter when the protein level was satisfactory for nonlactating cows, three winters with slight protein deficiencies, and one winter with a pronounced and extended deficiency. Phosphorus requirements of cattle were not generally met. There were phosphorus losses of 49–83 percent between October and March, depending on the amount of late fall and winter losses and leaching. The three principal grasses on the college range—black grama, mesa dropseed, and tobosa—lost an average of 23 percent of the calcium between October and March, but with excessive leaching the

loss of calcium was increased to 44 percent. The carotene contents of black grama were sufficient for beef cows even during gestation and lactation in 4 of the 5 years studied. Mesa dropseed grass lost all of its carotene soon after the end of the growing season and was of no value as a source of winter carotene. There were rather high contents of protein, calcium, and phosphorus in chamiza and sand sagebrush—valuable browse plants. Soil analyses showed a relationship between available soil phosphates and phosphorus in the forage. The quantity of amido protein present in black grama grass is suggested as a measure of the wintertime plant activity.

Johnson grass for silage best if cut before maturity, O. A. LEONARD (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 7, p. 2*).—In general, Johnson grass silage was equal to sorghum silage if not cut too mature. Chemical analyses showed that sorghum silage was much higher in sugar than Johnson grass silage, even though blackstrap molasses was added to the latter, at the rate of 60 lb. per ton, and not to the former. The total acidity and volatile acids were higher in sorghum silage than in silage from Johnson grass. However, in three tests conducted in 1941–44, Johnson grass silage was always considerably superior to sorghum silage in carotene content except for very mature Johnson grass silage in 1941. The analyses were made of the fresh Johnson grass and silage from the mature materials, after crushing and sending through the silage cutter, in comparison with sorghum silage.

Vitamins D and A in alfalfa hay, G. C. WALLIS (*South Dakota Sta. Cir. 53 (1944), pp. 12, illus. 1*).—Studies of the vitamin D in alfalfa at frequent intervals after cutting showed that hay exposed to the action of sunshine in small windrows developed vitamin D as rapidly as when in the swath, but there were small increases in the vitamin D content of cocked hay. The vitamin D of the swath- and windrow-cured hay by the end of the second day when the hay was dry enough to haul was only 277 and 262 International Units, respectively, which was only half the amount reached at 6 days when the hay was too dry, shattered badly, and lost its green color. Hay placed immediately in cocks showed an increase of only 50 to 100 I. U. of vitamin D even after several days of curing, and then only on the outside of the cock. Hay cured in the windrow or swath for 1½ days before hauling had 327 I. U. of vitamin D per pound, and had only 277 I. U. when it was raked into large windrows after ½ day in the swath. There was no further increase even after 8 days in cocks. Turning windrows increased the vitamin D potency of the hay. The highest D potencies of 2,413 and 1,950 I. U. were found in samples of third-cutting alfalfa which had been out in showers and cloudy weather, but vast differences were found in the D potency of like samples of hay subjected to similar treatments in different years.

Greener color was indicative of carotene preservation and a higher vitamin A content. Carotene was lost at about the same rate during the first day from curing in the swath, windrow, and cock, but thereafter there was appreciably greater loss from swath and windrow curing than from cock curing. Best results in the preservation of carotene, increase in vitamin D, and curing were associated with leaving the hay in large or small windrows. Good growth and efficient production were promoted in calves by these methods.

Carotene losses in freshly cut plant tissues, R. K. WAUGH, S. M. HAUGE, and J. H. HILTON. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 7, pp. 585–590*).—The destruction of carotene due to enzyme activity was greater in alfalfa, red clover, and sweetclover than in the oat plant, Kentucky bluegrass, or bromegrass. Other plants showed an intermediate enzyme destruction of the carotene. These conclusions regarding enzyme activity were ascertained by determining the carotene content before and after incubation or with incubation before and after autoclaving to destroy the enzymes.

On the vitamin B_c conjugate in yeast, S. B. BINKLEY, O. D. BIRD, E. S. BLOOM, R. A. BROWN, D. G. CALKINS, C. J. CAMPBELL, A. D. EMMETT, and J. J. PFIFFNER

(*Science, 100 (1944), No. 2585, pp. 36–37*).—Ultraviolet absorption spectra showed vitamin B_c compounds isolated from yeast and liver (E. S. R., 91, p. 186) to be identical. The chick antianemia activity in yeast extract is due to the presence of vitamin B_c, held almost entirely as a relatively simple conjugate.

On the mechanism of non-protein-nitrogen utilization by ruminants, B. C. Johnson, T. S. Hamilton, W. B. Robinson, and J. C. Garey. (Univ. Ill.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 287–298, illus. 2*).—On medium levels of protein intake, sheep which had been freed of protozoa by $CuSO_4$ administration and receiving a ration heated for 48 to 72 hr. at 65° C. were found to utilize the N of the ration about the same as normal sheep. In a ration in which 83 percent of the total N was in the form of urea, the average digestibility of this N fed to 6 lambs was 68.4 percent, with a biological value of 49. The dried protozoan fraction of the rumen contents, separated by filtration and centrifugation, contained 54.75 percent crude protein, with a digestibility of 86.2 percent and a biological value of 68 when fed to rats. A bacteriological fraction isolated from the paunch contents consisted of 44.50 percent protein. The digestibility of the protein in one preparation was 82.4 percent. The biological value fed at a level similar to that for the protozoa protein was 66 percent. Studies with two sheep showed that methane production was highest during the first hour after feeding and decreased quite rapidly for 3 to 4 hr. and then more slowly, until 9 hr. after feeding urea and casein rations it had decreased about 50 percent or more. The greatest number of bacteria and the fewest protozoa were found in the rumen 1 hr. after eating. The number of bacteria decreased from 6,500,000 per cubic centimeter 1 hr. after feeding, to 500,000 after 16 hr. The number of protozoa increased from 450,000 per cubic centimeter of rumen contents 1 hr. after feeding to 840,000 16 hr. after feeding. Microscopic studies of the rumen contents showed the presence of a yeastlike organism in large numbers. Evidently the feed N is synthesized into bacterial and then protozoan cellular proteins, which are finally digested by the host. The biological value finally approximates 60. N consumed above that required by the micro-organisms exhibits a biological value similar to that of nonruminants.

The war-time feeding of concentrated food to pregnant rabbits, T. Ashton (*Empire Jour. Expt. Agr., 12 (1944), No. 45, pp. 51–53*).—During pregnancy the appetite of does showed an unexpected general trend of decrease, both on a control ration of pellets and on a ration of potatoes. Hay consumption also showed a decrease. The weights at 10-day intervals showed increases even beyond those of the weights of the litters. The average birth weights from does on the pelleted mixture or potatoes have been significantly higher than those from does receiving no concentrates. Evidently the feeding of concentrates during pregnancy is not important, although greater birth weights are usually obtained.

Associative dynamic effects of protein, carbohydrate, and fat, E. B. Forbes and R. W. Swift. (Pa. State Col.) (*Science, 99 (1944), No. 2580, pp. 476–478, illus. 1*).—Separately determined dynamic effects of beef protein, dextrose, and lard, with 12 rats on each ration, were 32, 20, and 16 percent, respectively, of their gross energy values, and the dynamic effect of the combination of dextrose and protein was 12.5 percent less, of dextrose, protein, and lard 22 percent less, of dextrose and lard 35 percent less, and of protein and lard 54 percent less than as computed from the individual nutrients. Lard was much more potent than beef protein and conferred economy of utilization upon the nutrient with which it was combined. The results suggest no reason for decreasing the protein content of rations for hot weather. They also imply that any manufacturing process that decreases the fat content of the byproduct feed serves to lower the net energy value of the products through decreasing their gross energy and by increasing the energy expense of their utilization.

Commercial feeding stuffs from September 1, 1942, to August 31, 1943, F. D. Fuller and F. D. Brock (*Texas Sta. Bul. 640 (1943), p. 223*).—The guaranteed and found analyses of 3,564 samples of feeds chemically and microscopically examined in Texas during the year ended August 31, 1943 (E. S. R., 89, p. 469) are presented.

Correlation between rate and efficiency of gain in steers, B. Knapp, Jr., and A. L. Baker. (U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 219–223, illus. 2*).—A correlation of only 0.49 was calculated between the rate and gross efficiency of gain of 66 steers individually fed for 273 days from weaning weights ranging from 298 to 492 lb. to final weights from 759 to 1,134 lb. This suggests a relatively high error in selection for efficiency based on rate of gains produced. When the efficiencies of individuals were corrected to methods proposed by Titus et al. (E. S. R., 71, p. 825) for chickens, the correlation was raised to 0.83. Thus daily gain may be used with a high degree of accuracy to predict efficiency of gain at comparable weights, but not observed gross efficiency. There were 6 to 8 steer progeny of each of the 9 sires in the study. Significant differences were found in the regression coefficients for the efficiency of gain and weight between progeny of the sires. Only animals of the same size should be used for comparing gross efficiencies. In feeding tests differences in the relation of rate of gain to feed requirements per unit of gain were noted for different feeding experiments.

Dried beet pulp for fattening steers, M. L. Baker, C. F. Reinmiller, and G. N. Baker (*Nebraska Sta. Bul. 359 (1944), pp. 10*).—In three trials, comparisons were made for steer calves of full-fed shelled corn; a mixture of two-thirds shelled corn and one-third dried beet pulp; and a mixture of equal parts of shelled corn and dried beet pulp. In addition to these feeds, there were supplied sorgo silage, alfalfa hay, and soybean pellets or linseed cake. The average initial weights of the calves in the three trials were 684, 567, and 550 lb., and the duration of feeding, 224, 238, and 235 days, respectively. In the three experiments the average daily gain varied only from 2.07 to 2.30 lb. per lot for the calves of different weights and on the different rations. There were only slight differences in the amounts of feed required per unit of gain. In market and slaughter quality, steers fed mixtures containing dried beet pulp were fully equal to steers finished on shelled corn alone. Steers fed equal parts of corn and dried beet pulp shrank more heavily than the other two lots in each trial. However, in all three trials, steers fed mixtures containing dried beet pulp yielded a higher percentage of beef than steers fed corn. The carcasses of steers on corn were somewhat more uniform than those with dried beet pulp, but there was little difference in carcass grade.

Further studies on riboflavin and thiamine in the rumen content of cattle, II, C. H. Hunt, E. W. Burroughs, R. M. Bethke, A. F. Schalk, and P. Gerlaugh. (Ohio Expt. Sta.). (*Jour. Nutr., 25 (1943), No. 3, pp. 207–216*).—Continuing these studies (E. S. R., 84, p. 799), riboflavin was synthesized in the rumen from a ration of corn, alfalfa hay, and a protein supplement, but when corn was omitted there was no synthesis as judged by assay of the rumen contents. As the amount of corn was increased in the ration, there was a corresponding increase in the riboflavin in the contents of the ingesta. The comparative thiamine content of the high and low corn rations and the ingesta gave no evidence that thiamine was synthesized except in one of three experiments in which ground corn was fed. Results with whole corn and with partially synthetic low vitamin rations showed that there was a loss of thiamine in the ingesta as compared with the feed in three fistulated steers, but the loss decreased as the amount of corn or carbohydrates increased.

Vitamin A deficiency in the production of pregnancy disease of sheep, J. O. Foss and D. F. Eveleth. (N. Dak. Expt. Sta.). (*Vet. Med., 39 (1944), No. 8, pp. 313–315, illus. 3*).—The syndrome of pathological symptoms in ewes designated

as pregnancy disease was associated with vitamin A deficiency. In tests with several flocks there was found to be a low carotene content of the alfalfa hay and silage. With the addition to the same ration of supplements containing vitamins A and D, no new cases of pregnancy disease developed after 48 hr. A ewe ready to lamb gave a strong ketosis test in the urine. These data indicate that a vitamin A deficiency involving the production of ketosis in pregnant ewes may be responsible for pregnancy disease.

Northwestern, southwestern, and native Mississippi ewes for wool and spring lamb production, R. H. MEANS (*Miss. Farm Res.* [*Mississippi Sta.*], *7* (*1944*), *No. 7, pp. 1, 8*).—Montana ewes were exceptionally good milk producers and able to produce a 70-lb. lamb in less time than the Texas or Corriedale × native ewes. When bred to Southdown rams the Montana ewes produced about 10 percent more choice and good lambs than the Texas ewes and 22 percent more than Corriedale × native ewes. From the value of lambs and wool produced, the Montana ewes ranked first, the Corriedale × natives second, and the Texas ewes third. These results were based on 30, 18, and 29 ewes in the respective lots.

A survey of the fibre fineness of Australian Merino wool, W. R. LANG (*Gordon Inst. Technol. Pub. 5* (*1944*), *pp. 8+, illus. 4*).—A survey of the fineness of 1,625 Merino wools from 61 sources in Australia is reported. The relationship of crimp to fineness reveals a trend toward wools that are finer than the crimp itself would indicate. In making the studies, fleece samples were taken from the midside, a "hand span" from the midline of the back and about 2 in. behind the heart girth, and from the midthigh and the withers at the same levels. A statistical analysis of the relation of crimp to fineness is presented.

Swine feeding investigations, 1930 to 1935, C. E. AUBEL and W. E. CONNELL (*Kansas Sta. Cir. 223* (*1944*), *pp. 24, illus. 1*).—This is a revision of Circular 188 (E. S. R., 78, p. 680).

Toxic effects in the feeding of cocoa meal to pigs, R. BRAUDE (*Vet. Jour., 99* (*1943*), *No. 12, pp. 302–307, illus. 1*).—In three-group feeding trials, continuing the studies of feeding cocoa meal to pigs (E. S. R., 88, p. 376), the toxicity of cocoa meal was shown when it was included as 7.5 percent of the ration in place of ground oats. The average daily gain on the basal ration alone or with 5 percent cocoa meal was about 0.7 lb., but with the greater amount of cocoa meal the gains were reduced to less than 0.6 lb. per day, probably because of the theobromine. In the study, 44 pigs were included for 15 weeks.

Home curing of bacon and hams: A manual of theory and practice for instructors and others, C. DREWE ET AL. ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 127* (*1944*), *pp. 57+, illus. 17*).—In this manual, compiled by the Small Pig Keepers' Council, general directions are given for home slaughtering, cutting, and curing of pork products.

Variation of serum composition with the age of horses as shown by electrophoresis, A. POLSON (*Nature* [*London*], *152* (*1943*), *No. 3858, pp. 413–414, illus. 5*).—Serum from the newborn foal had a total protein percentage of albumin 65, α-globulin 32, β-globulin 3, and γ-globulin 0. As age advanced the albumins of horses decreased slightly and the α- and β-globulins decreased but the γ-globulin increased.

Level and source of protein in poultry production, I, II (*Sci. Agr., 24* (*1943*), *No. 4, pp. 164–175, illus. 4; 24* (*1944*), *No. 5, pp. 240–250*).—Two papers.

I. *As related to economical production of growth in pullets,* H. S. Gutteridge, J. B. O'Neil, and J. M. Pratt.—The growth of 6 lots of approximately 100 day-old sexed Barred Rock chicks from hatching to 24 weeks of age was compared on low-, medium-, and high-protein rations from animal ingredients and, mainly, soybean meal. Each lot was allowed approximately 70 sq. ft. of pasture per bird 18 days after hatching. The ratio of mash to grain was adjusted by decreasing the propor-

tion of mash and increasing the proportion of grain as age advanced. Based on the weights attained at given ages, the low-protein levels were inadequate. A longer rearing period was required to attain sexual maturity with the lower protein rations. Differences between the medium- and high-protein rations of 14.69 and 17.13 percent, respectively, from animal sources and 14.34 and 17.02 percent from plant sources had such small effects on body weight as to be of little practical value. The high-animal-protein group was definitely superior to the others in weight and mortality. Pasture was utilized to an increasing degree on the lower levels of protein, but little pasture was eaten on the high-animal-protein ration.

II. *As related to economical production of eggs,* H. S. Gutteridge, J. M. Pratt, and J. B. O'Neil.—The pullets reared on the low-protein ration failed to give satisfactory egg production, egg weight, body weight, and days to first egg in laying trials. To a limited extent, the low egg production was due to a delay in sexual maturity. However, after correction was made for this delay, the average production per bird was still some 17 eggs lower in the biological year than with the next higher protein level. As low as 12.5 percent protein in the laying ration had a retarding effect on egg production. Differences in production were not great between high- and medium-protein rations. Animal protein was significantly superior to vegetable protein in stimulating body weight, feed consumption, and sexual maturity. Egg weight favored the soybean meal protein. Evidently the period of rearing is somewhat more exacting than the period of production, possibly because of the greater amino acid requirement for growth. The birds were equally divided between laying battery and laying-house pen. The laying battery is preferred to the laying pen, but the weight of the first 10 eggs produced in the laying pen exceeded the weight of those produced in the battery, probably because of the delayed age.

Satisfactory early chick growth on a diet containing no animal protein, W. H. Ott (*Poultry Sci., 23 (1944), No. 3, pp. 252–253*).—Single-Comb White Leghorn chicks reared on a ration of yellow corn meal 27 parts, soybean meal 25, wheat bran 15, wheat middlings 15, ground oats 10, alfalfa meal 5, $CaCO_3$ 1.75, bone ash 0.75, NaCl 0.5, 400D fish-liver oil 0.25, $MnSO_4$ 0.01, and riboflavin 0.0003 part by weight averaged 154 gm. at 3 weeks of age. Growth was not increased by the addition of thiamine, calcium pantothenate, or more riboflavin. Approximately the same growth was obtained by four other lots of chicks receiving animal and vegetable protein supplements. Mortality was essentially zero in all lots.

Minimum levels of animal protein for reproduction, H. S. Wilgus, Jr., and D. V. Zander. (Colo. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 4, pp. 344–346*).—In a trial from 26 to 40 weeks of age with 3 lots of 29 New Hampshire pullets and 3 cockerels each, it was demonstrated that egg production, egg size, body weight, and mortality were satisfactory on a high soybean meal ration, but hatchability was reduced and the chicks failed to grow. Attainment of 20-percent production in the pullets was delayed 7 weeks by the use of soybean meal as the sole protein supplement. The inclusion of 5 percent meat and bone scrap in the mash, thus contributing about 8 percent of the total protein in the ration, provided satisfactory production and reproduction.

Mutual supplementary effect of the proteins of soybean and sesame meals, H. J. Almquist and C. R. Grau. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 4, pp. 341–343*).—Continuing the study of methionine deficiency of soybeans (E. S. R., 88, p. 801), sesame and soybean meals were found to exert a marked mutual supplemental effect as measured by total gain and efficiency of feed utilization by 10-day-old White Leghorn chicks fed for 12 to 16 days. The best gains were made when the sesame-soybean protein ratio neared 7 : 13. Lysine was found to be deficient in the proteins of sesame meal and uncooked, ether-extracted sesame seeds.

The supplementary value of choline and methionine in a corn and soybean oil meal chick ration, J. A. Marvel, C. W. Carrick, R. E. Roberts, and S. M.

HAUGE. (Ind. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 4, pp. 294–297*).—A ration of ground yellow corn, soybean meal, and distillers' dried solubles supplemented with minerals and vitamins, including choline, produced growth in chicks equal to that obtained with meat and bone scrap in a practical control ration. Six lots of at first 40 and later 20 or 25 Barred Plymouth Rock chicks were fed on rations of ground yellow corn, soybean meal, and alfalfa meal with varying amounts of vitamins and minerals. Average weights of 397 gm. were attained at 6 weeks of age, whereas a group receiving meat and bone scrap, minerals, and other vitamins averaged 399 gm. Interchangeable supplementary action was exerted by choline and methionine as indicated by these supplements together and separately.

The use of field-damaged soybeans in feeding chicks, L. E. CARD and A. V. NALBANDOV. (Ill. Expt. Sta.) (*Poultry Sci., 23 (1944), No. 3, pp. 163–164*).—Soybean meal from beans showing 10 and 40 percent field damage proved as nutritious and as palatable for chicks from hatching to 6 weeks of age as meal from unspoiled beans. The basic ration of yellow corn 41, wheat bran 15, wheat middlings 10, meat scraps 3, dried milk 2, soybean meal 20, alfalfa leaf meal 5, steamed bone meal 2, limestone 1, and salt 1 produced average weights at 42 days of 408.3 gm. When the soybean meal was made from soybeans which were 10 percent and 40 percent field damaged, the average weights at 42 days of age were 420.6 and 403.5 gm. When the meat scrap and dried milk were replaced by soybean meal from undamaged and 40 percent damaged soybeans, the weights at 42 days of age were 403.3 and 375.5 gm., respectively.

The value of soybean oil meal processed from damaged beans, H. S. WILGUS [Jr.] and D. V. ZANDER. (Colo. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 4, pp. 343–344*).—There were no biologically significant differences between lots of chicks on meal from frost-damaged and normal soybeans when fed with meat and bone scrap, but the meal from the damaged beans was slightly inferior to meal from normal beans when no meat and bone scrap was included. Meal from frost-damaged immature soybeans was satisfactory for chicks on the starting ration containing 25 percent or more of meat and bone scrap. Lots of about 30 chicks each were fed meal from normal and damaged beans with and without whey and riboflavin. Alfalfa meal was generally included in one experiment but not in the other.

The use of corn gluten feed to replace meat meal in poultry rations, S. J. SLINGER, J. H. PETTIT, and E. V. EVANS (*Sci. Agr., 24 (1944), No. 5, pp. 234–239, illus. 2*).—Corn gluten feed was a suitable protein source to replace part of the meat meal in a ration for growing chicks up to 10 weeks of age. When included up to 26 percent of the ration, it did not affect feed consumption, indicating that it was not unpalatable to the birds, and there was no mortality with two lots receiving 10 and 15 percent in the ration. Eight lots of 34 Barred Plymouth Rock chicks were fed different amounts of this feed from 0 to 26 percent, with 10.5 to 0 percent of the meat scrap, respectively. The 10-week weight data were analyzed for significance by the method of weighted squares of the means and the *F* test of Snedecor (E. S. R., 84, p. 858) and by methods previously employed by Titus and Hammond (E. S. R., 73, p. 527). A further experiment, with 4 lots of 25 Barred Plymouth Rock pullets and 2 cockerels each, was made on egg production and hatchability as influenced by replacing part of the meat meal with corn gluten feed up to 16 percent of the ration. The results indicated that up to this amount may be used in the mash, replacing meat meal during the 3 months' laying period.

Corn distillers' by-products in poultry rations.—I, Chick rations, W. L. NELSON, F. E. VOLZ, R. T. PARKHURST, and L. R. PARKINSON. (Mass. Expt. Sta. et al.). (*Poultry Sci., 23 (1944), No. 4, pp. 278–286*).—In three experiments in which lots of 10–52 chicks or cockerels were fed to 4, 6, 8, 10, and 12 weeks of age, it was found that corn distillers' dried grains without solubles satisfactorily replaced ground oats and dried grains but not wheat bran and dried distillers' solubles

in starter and broiler rations. If the rations contained 2.5 percent dried solubles, both wheat bran and ground oats and wheat bran alone were effectively replaced. The results indicated that evidently a factor is present both in dried solubles and wheat bran but absent or low in value in corn distillers' dried grains without solubles, and that ground oats is responsible for both growth differences. Corn distillers' dried grains without solubles somewhat improved the feed efficiency. Differences in pigmentation and feathering were negligible. Corn distillers' grains with solubles satisfactorily replaced dried skim milk and wheat bran, wheat middlings, or ground oats in chick starting rations, with improvement in feed efficiency. Additional energy was needed for growth when corn distiller's dried grains with solubles were used in place of all the wheat bran, wheat middlings, and ground oats. Soybean meal with corn distillers' byproducts replaced the dried skim milk, fish meal, and meat scraps with satisfactory results in starting rations. The dried distillers' solubles did not equal dried skim milk on an equal riboflavin basis, but dried semisolid sirups did replace dried skim milk, indicating possibly some loss of nutritive value in the process of drying solubles. There were used in the studies Single-Comb Rhode Island Red, White Plymouth Rock, and New Hampshire Red chicks.

A preliminary investigation on the use of certain dried vegetable wastes as poultry feeds, A. E. Tomhave, E. Hoffmann, E. G. Kelley, M. E. Wall, and D. A. Colker. (Coop. U. S. D. A.). (*Delaware Sta. Bul. 247 (1944), pp. 32, illus. 9*).—Dried vegetable wastes from dried pea vines, lima bean vines, turnip tops, broccoli, and carrot tops may be fed as high as 8 percent of the total feed in broiler mashes. The vegetable wastes were substituted for equal amounts of alfalfa leaf meal without harmful effects. The experiment was conducted over a 14-week period with 7 lots of 200 New Hampshire chicks each. The average weights of the chicks at 14 weeks of age, with the vegetable wastes included in the ration, were broccoli 2.73 lb., carrot tops 2.65, turnip tops 2.59, lima bean vines 2.51, and pea vines 2.10 lb. as contrasted with 2.55 lb. for the group receiving alfalfa leaf meal and 1.94 lb. for that receiving no vegetable wastes or alfalfa meal. The advantage of the broccoli and carrot-top groups occurred only after the twelfth week. Further tests showed that the soybean meal, as about 20 percent of the mash, was of inferior grade. The group fed no vegetable supplement had about six times the mortality of those receiving the dried vegetable wastes, but there were no significant differences between the different wastes. The broccoli and turnip-top rations produced a greater degree of pigmentation than alfalfa meal. Birds fed lima bean vines and carrot tops were slightly superior in pigmentation, and those with pea vines were inferior in pigmentation, to those on alfalfa leaf meal rations. Pigmentation and palatability on the rations without the vegetable proteins were very low.

The pantothenic acid requirement of hens fed a heated diet, M. B. Gillis, G. F. Heuser, and L. C. Norris. (Cornell Univ.). (*Jour. Nutr., 26 (1943), No. 3, pp. 285–292*).—The basal ration used in previous experiments (E. S. R., 87, p. 409), with the addition of liver extracts from which pantothenic acid was destroyed, was shown to contain 210 μg. of pantothenic acid per 100 gm. of the ration, and the hatchability of fertile eggs produced by hens receiving this ration decreased from 79 percent to about 10 percent in a 6-week period for 30 pullets. No further decrease occurred during the rest of the 12-week period in the first experiment. In other lots of 15 pullets each, 250, 500, 1,000, and 2,000 μg. of pantothenic acid per 100 gm. of the ration were tested. Subsequently the hens, after 4 weeks on a complex ration, were placed for 10 weeks on rations with 500, 1,000, 1,500, 2,000, or 2,500 μg. of pantothenic acid added per 100 gm. of feed. Hens were found to require between 1,200 and 1,700 μg. of pantothenic acid per 100 gm. of feed to maintain optimum reproduction, but the requirement for egg production was not more than 700 μg. Weight and livability were satisfactorily maintained on the basal ration, which contained only 200 μg. of pantothenic acid per 100 gm. of feed. The marked effect

of pantothenic acid-deficient rations on viability of the chicks hatched from the eggs, even when additions of pantothenic acid were provided, suggests the deficiency in the basal ration of a factor or factors needed for reproduction in addition to pantothenic acid.

Deficiency of unidentified vitamins in practical chick rations, F. W. Hill, M. L. Scott, L. C. Norris, and G. F. Heuser. (Cornell Univ.). (*Poultry Sci., 23 (1944), No. 3, pp. 253–255*).—It was shown that certain chick rations containing limited amounts of animal proteins were deficient in an unknown growth factor or factors. The differences in the weights of the chicks at 8 weeks of age showed from the *t* values that significant increases in growth were produced when there were additions of 10 percent dried distillers' solubles or 5 percent dried brewers' yeast to rations which included synthetic riboflavin or fermented whey. Highly significant values were observed in growth on these rations supplied with 4 percent dried whey and with 5 percent dried brewers' yeast with fermented whey. It appeared that the deficiencies encountered were not due to lack of thiamine, pantothenic acid, pyridoxine, niacin, biotin, inositol, riboflavin, folic acid, or vitamin B_c.

The toe ash as a measure of calcification in chicks, R. J. Evans and J. S. Carver. (Wash. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 4, pp. 351–352, illus. 1*).—The ash in the middle toe of the left foot of 32 groups of 15 New Hampshire chicks each, fed various levels of calcium and phosphorus, was very similar to the ash content of the tibia. A highly significant correlation of +0.847 was calculated between them, and the toe ash determination was much simpler, more rapid, and may be ascertained without killing the bird.

The diet of hens and the vitamin A potency of their eggs, H. J. Almquist, G. Mackinney, and E. Mecchi. (Univ. Calif). (*Jour. Biol. Chem., 150 (1943), No. 1, pp. 99–105*).—Comparison of the vitamin A in the eggs of hens which had received vitamin A in shark-liver oil, cod-liver oil, or carotene in alfalfa, or in solution in ethyl laurate, showed carotene to be efficiently converted into vitamin A by the hen. Practical dietary levels of vitamin A in the form of carotene or of vitamin A gave an equivalent potency of vitamin A in the yolks. About 12 hens were separately fed on the different forms of vitamin A and provitamin A in the ration.

The effect of cereal grains and their by-products on plumage development and body growth of the chick, P. E. Sanford and H. L. Wilcke. (Iowa Expt. Sta.). (*Poultry Sci., 23 (1944), No. 4, pp. 298–309, illus. 6*).—Studies of the effect of oat groats, untreated and autoclaved oat hulls, ground wheat, wheat bran, and wheat shorts on the weights and feather development of chicks showed that the three oat rations accelerated the rate of feather growth in the order of untreated oat hulls, autoclaved oat hulls, and oat groats. The three wheat feeds were ranked for feather growth as wheat bran, wheat shorts, and ground wheat. With acceleration of rate of feathering, there was an increase in body weight. The greatest number of chicks with abnormal types of plumage occurred in the lots receiving ground wheat and wheat shorts. Autoclaving inhibited the factor or factors necessary for normal pigmentation. The ash contained in the feathers was related to the ash contained in the ration. Differences in feather structure were in part due to differences in the number of barbicels. Oat hulls and wheat bran were excellent sources of the growth-promoting factor or factors. Oat groats, wheat shorts, and ground wheat were deficient in growth-promoting factors. Autoclaving oat hulls had little influence on the growth-promoting properties. The feeds ranked, from the standpoint of feed efficiency, as follows: Oat groats, untreated oat hulls, wheat bran, autoclaved oat hulls, wheat shorts, and ground wheat. Sex had little influence on the rate of feather growth as measured by the weight of feathers, but it was important in determining the growth in length of primary and secondary wing feathers. Feathers from male chicks had more total ash than feathers from female chicks. Males were heavier than females. The study was conducted in two experiments with a total of 510 1- and

8-day-old New Hampshire chicks, fed to 8 weeks of age. The feeds were compounded so that they contained about 20 percent protein. Data were recorded on the feather lengths, numbers, weights, scores, percentages of total feather ash, and body weights in both experiments, with analysis of variance.

An experience with feather picking and cannibalism of pullet layers, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 229 (1944), pp. 215–217*).—Feather picking and cannibalism became so firmly established in 6 groups of 70 Rhode Island Red pullets each, fed on low-protein rations and whole grains, that it was necessary in controlling them to remove the upper beak by a special tearing process. No additional grain should be fed to layers confined indoors with a 15–17-percent-protein ration if cannibalism is to be avoided. Free-choice feeding of whole grains may have disadvantages.

The influence of dietary factors on egg shell quality.—III, Vitamin D, R. J. EVANS, J. S. CARVER, and L. A. WILHELM. (Wash. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 3, pp. 234–238*).—Continuing this series (E. S. R., 91, p. 65), in six 28-day feeding periods no significant differences were noted in egg production, shell thickness, shell smoothness, or albumin index of the eggs of 6 lots of 22 laying Leghorn pullets each, receiving 44, 103, or 160 units of vitamin D per 100 gm. of feed. In a second experiment, 16 lots of 8 Single-Comb White Leghorn pullets each, housed without access to sunlight, received 40, 60, 80, and 100 units of vitamin D per 100 gm. of ration containing 2.5 percent Ca and 0.8 percent P or 1.5 percent Ca and 0.6 percent P. The level of vitamin D in the ration appeared to have little effect on the body weight or feed consumption. At 40 units of vitamin D, production decreased, but 60 units gave as good egg production as higher levels at the 2.5 percent Ca level. No significant differences were observed in shell thickness, shell weight, or shell smoothness. There were no noticeable effects from the inclusion of different amounts of vitamin D in rations of 1.5 percent Ca and 0.6 percent P, but levels of 100 A. O. A. C. chick units per 100 gm. were slightly better than lower levels in preventing a decrease in shell thickness.

The problem of blood clots and meat spots in chicken eggs, A. V. NALBANDOV and L. E. CARD. (Ill. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 3, pp. 170–180, illus. 2*).—Observations of laparotomized hens showed that bleeding may occur at any time somewhere in the oviduct. Yolks may be released with small or large blood clots hanging to them. If the bleeding is not too copious, the blood remains between the yolk and the follicle. If bleeding is very severe, a wide sheet of blood may envelope most of the surface of the yolk. When blood diffuses throughout the thick and thin white, a bloody white results from the dissolution of the blood clot. The formation of a meat spot from a blood clot was effected at 88° F. in about 8 days, but not at 50°. Meat spots formed at 50° and 88° in unvarnished eggs with blood clots, but more quickly at the higher temperatures, presumably because of the change in pH. Unopened eggs covered with oil and containing a blood clot were slow in changing color, and a typical meat spot never did form unless air was admitted. Transformation of a blood clot into a meat spot is based on the formation of oxyhemoglobin, which shows the bright red color of fresh blood. Under the influence of an acid or a base, it breaks down into protein and acid or alkali hematin of the tan or yellow color of a meat spot. If intrafollicular hemorrhage has occurred several days prior to ovulation, the body heat will form meat spots from small clots by the time of laying. Attempts to prevent intrafollicular hemorrhages by the separate administration of vitamins A, C, D, E, K, and P were without success, but combinations were not tried. When hens were turned out on range, both the frequency and size of blood clots diminished. When the hens were confined the occurrence of blood clots increased. As maturity advanced, there was a decrease in the occurrence of clots, the average being 44 percent the first year, 26 percent the second, and 22 percent the third year. The hatching power of eggs with blood spots was normal.

The effect of D-activated animal sterol and sunlight on hatchability, B. W. Heywang. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 3, pp. 165–169, illus. 1*).—Direct sunlight or 540 units of vitamin D from cod-liver oil or from D-activated animal sterol with and without direct sunlight fed per pound of ration were equally good sources of vitamin D for hatchability as judged by respective values of the statistic $\bar{p}$. Direct sunlight, however, was not as good as 2,700 units of vitamin D per pound of ration from D-activated animal sterol. The variance analysis from 2 years' experiments showed that the $\bar{p}$ values for all the groups receiving 2,700 units of vitamin D per pound of ration but no direct sunlight was significantly greater than the $\bar{p}$ values for the groups receiving 540 or 2,700 units of vitamin D per pound of ration and direct sunlight and for the groups receiving no vitamin D but direct sunlight. Hatchability was not lowered significantly when 540 units of vitamin D per pound of ration were fed and sunlight was available. The experiments were conducted in two tests of about 1 year's duration each with fertility and hatchability of eggs laid by 12 groups each year, with 25 White Leghorn pullets per lot supplied with 540 and 2,700 units of vitamin D from activated sterols or in one case cod-liver oil with and without sunlight.

The hatchability of eggs from hens receiving cod-liver oil and direct sunlight, B. W. Heywang. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 3, pp. 230–233*).—No significant differences were noted in the hatchability of eggs from 4 groups of White Leghorn hens with direct sunlight, cod-liver oil without direct sunlight, or both. Two experiments were conducted with 2 lots of 25 hens each fed in duplicate. The variance analysis of differences in the values of the statistic $\bar{p}$ in each separate experiment and among the values of $\bar{p}$ calculated from the combined effects indicated that hatchability was not significantly affected when cod-liver oil was supplied in addition to sunlight. There were about 7.6 hr. of sunlight per day in the first experiment and 8.1 hr. in the second. The cod-liver oil given with and without sunlight furnished about 540 A. O. A. C. chick units of vitamin D per pound of ration consumed.

Effect of length of incubation period on gross nutritive value of contents of fertile eggs, J. C. Hammond, J. C. Fritz, R. B. Nestler, and H. W. Titus. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 3, pp. 217–220*).—Chicks fed about 16 percent of the ration in dried fresh eggs or eggs dried after incubation from 1 to 14 days grew as well or better to 6 and 10 weeks of age as others fed an equal quantity of protein from a mixture of dried skim milk, meat-and-bone scrap, and whitefish meal. Differences in efficiency of feed utilization due to rations were not statistically significant at either age, but in each case the dried egg contents were more efficiently utilized on an average than the control ration. The study was conducted with 16 pens of 40 Rhode Island Red chicks each, raised in confinement to 10 weeks of age with rations of ground yellow corn, wheat flour middlings, ground oats, alfalfa leaf meal, soybean meal, wheat bran, linseed meal, and minerals and cod-liver oil, with proteins from dried eggs incubated 0, 1, 4, 7, 10, 14, and 18 days, or from other animal sources. This experiment offers confirmation of the findings of Willman et al. (E. S. R., 87, p. 101).

An effect of ration on mortality of laying hens, L. W. Taylor, I. M. Lerner, and K. B. DeOme. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 3, pp. 181–188*).—A ration of which the mash consisted of about one-half yellow corn and the scratch of one-third corn, one-third wheat, and one-third barley, each fed continuously during the first 18 mo. of life produced a significantly higher laying hen mortality than a similar ration in which the corn of the mash was largely replaced by barley. Differences in mortality were largely accounted for by an increase in the pathological condition of the reproductive tract, such as ruptured and flabby ova, occluded oviducts, reverse peristalsis, and prolapsus. When the corn ration was fed only during the rearing period or only during the first laying year, significant

differences were not produced in mortality, although there was greater mortality than in the barley-fed lots. Although the production index in the barley-fed lots excelled those in the corn-fed lots, the egg production of survivors in the corn-fed lots was superior. Differences in the production index were entirely due to the differential mortality. The studies were conducted with more than 1,000 chicks hatched in 1937, 1939, 1940, and 1941, fed on the corn and barley rations. The rations were alternated for some of the laying periods. Average weights at 6 weeks of age excelled for those on the corn ration.

Some measurable effects of social organization in flocks of hens, A. M. GUHL and W. C. ALLEE (*Physiol. Zool., 17 (1944), No. 3, pp. 320–347, illus 8*). —Social organization in flocks of White Leghorn hens is apparently of value because it tends to reduce fighting and other extremes of social tension.

Composition of blood of normal turkeys, M. RHIAN, W. O. WILSON, and A. L. MOXON. (S. Dak. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 3, pp. 224–229*).—The plasma vitamin C was determined on the same date for 48 Broad-Breasted Bronze turkey hens as 0.950 mg. per 100 cc., and for 12 Beltsville Small White hens as 0.876 mg. per 100 cc. Analysis of the composition of the blood of 16 Bronze hens and 4 toms at different dates showed no relation between the blood constituents and fertility and hatchability of the eggs, except for hematocrit. Marked individual hen variation occurred with significant F values between hens for phosphorus and hemoglobin and highly significant values in hematocrit, calcium, and carotene. The different dates of sampling showed highly significant differences for carotene, vitamin C, glutathione, sugar, and phosphorus. A highly significant difference was found between layers and nonlayers in plasma calcium. Toms showed similar blood composition to hens.

Feather yields in turkeys, J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 3, p. 247*).—In a group of 30 Beltsville Small White female turkeys, dressed at 28 weeks of age, the loss in weight was 10.03 ± 0.85, of which the blood accounted for 3.10 ± 0.50 percent and the feathers 6.93 ± 0.80 percent. In a small group of old male turkeys of various varieties, the dressing loss of 8.76 ± 0.86 percent was accounted for as 4.16 ± 0.86 percent by blood and 4.58 ± 0.68 percent by feathers.

The minimum phosphorus requirements of growing turkeys, J. C. HAMMOND, H. E. MCCLURE, and W. L. KELLOGG. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 3, pp. 239–241*).—Twelve lots of 20 Beltsville Small White poults each were brooded with a basal ration with additions of 1, 2, and 5 percent of bone meal in different lots. Cod-liver oil was added to supply 80, 160, and 320 A. O. A. C. chick units of vitamin D per 100 gm. of the ration. All the poults made normal growth to 8 weeks. Efficiency of feed utilization to 4 weeks was higher at the two lower levels of phosphorus intake than at the two higher levels. It seems unnecessary to provide growing turkeys with more than 0.6 percent of phosphorus in the ration, and under favorable conditions it may contain as little as 0.5 percent without detrimental effects.

Further observations on the vitamin D requirement of turkey poults, T. D. SANFORD and T. H. JUKES. (Univ. Calif. et al.). (*Poultry Sci., 23 (1944), No. 3, pp. 221–223*).—Continuing the studies of vitamin D requirements by poults (E. S. R., 81, p. 698), the maximum calcification at 4 weeks in turkey poults was induced by about 200 A. O. A. C. units of vitamin D from Reference cod-liver oil, but the corresponding requirement was lower in case of vitamin D from a fish-oil blend and from an irradiated animal sterol (Delsterol). With the low levels of vitamin D there was a high incidence of crooked breastbones at 4 weeks of age. The study was conducted with 16 groups of 14 poults each in electrically heated battery brooders from which all daylight was excluded. Two basal rations were employed.

Practical pigeon production: A practical manual and reliable handbook on squab production as a profitable enterprise, S. K. Haynes (*New York: Orange Judd Pub. Co., 1944, pp. 263+, illus. 56*).—The essentials necessary for squab production, including descriptions of pigeon breeds and directions for breeding, feeding, housing, and management of pigeons.

DAIRY FARMING—DAIRYING

The intensity of feeding as related to milk production, T. A. Baker and A. E. Tomhave (*Delaware Sta. Bul. 248 (1944), pp. 15, illus. 4*).—In testing the effects of feeding in excess of the Haecker standard, five groups of five Holstein cows each were fed maintenance rations plus allowances of total digestible nutrients for milk production equal to 82.2, 105.3, 122.4, and 131 percent of the Haecker standard, showing that substantial increases were obtained by larger amounts of nutrients. However, the amount of milk produced for each pound of total digestible nutrients was greatest at the lowest feeding levels. The body weight, condition of the cows, and fat percentages of the milk were unaffected by feeding different levels of digestible nutrients. The results were based on corrected milk production on a 4-percent-fat basis throughout 2 years' trials on each of the bases of feeding.

Utilization of urea and growth of heifer calves with corn molasses or cane molasses as the only readily available carbohydrate in the ration, R. C. Mills, C. C. Lardinois, I. W. Rupel, and E. B. Hart. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 7, pp. 571–578*).—In further study of urea utilization by the ruminant (E. S. R., 88, p. 667), urea was fairly well utilized by a Holstein heifer with a rumen fistula on a ration of timothy hay to which was added corn molasses. The protein level of the rumen contents rose from 7.7 to 10.9 percent on a ration of timothy hay, starch, corn molasses, and urea, which was slightly better than 9.28 percent on a ration of timothy hay and corn molasses. A ration of timothy hay, cane molasses, and urea fortified with common salt, bonemeal, and vitamin A produced growth in young heifers of 0.6 to 0.8 lb. daily. When this ration was supplemented with 0.3 lb. of casein or cornstarch daily, normal gains were produced by three calves fed during a 19-week period. Experience indicates that the supplemental material need not be more than 3 to 5 percent of the total ration.

Vitamins in calf health, J. K. Loosli. (Cornell Univ.). (*Cornell Vet., 34 (1944), No. 2, pp. 147–151, illus. 1*).—A general discussion of the vitamin needs of calves, with special attention to vitamins A, C, and D and niacin. The advantage, if any, is small in feeding extra vitamins beyond the amounts supplied by whole milk, good hay, and a good starter.

Acetonemia, a vitamin A deficiency, II, J. W. Patton (*Vet. Med., 39 (1944), No. 7, pp. 271–278, illus. 5*).—Continuing these studies (E. S. R., 91, p. 330), below-normal blood sugar and above-normal blood acetone are common in southern cattle during the dry feeding period or when producing only meager quantities or no milk, but they showed no acetonemia symptoms unless some depleting influence, such as parturition, supervenes. Vitamin A therapy raised the blood sugar level and decreased the blood acetone level of 19 cows. The carotene-vitamin A balance was improved by vitamin A administration, as was also improved milk production. The dose of vitamin A recommended for these cows in clinical treatments of acetonemia was 1,000,000 International Units per cow per day for 3 days or longer.

Lactation, W. E. Petersen (*Physiol. Rev., 24 (1944), No. 3, pp. 340-371*).—Contributions to the subject are reviewed, giving special attention to the development of the mammary gland, lactation, and the secretion and letting down of milk. An extensive bibliography including 349 references is given.

Observations on the effects of an anterior pituitary preparation administered to lactating dairy cows, J. F. Sykes, I. A. Gould, C. W. Duncan, and C. F.

HUFFMAN. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 7, pp. 539–543, illus. 1*).—In carrying forward studies on the effect of anterior pituitary extract on butterfat and other milk constituents (E. S. R., 87, p. 105), injections of the glandular extract produced an initial increase in fat percentage and a moderate increase in lactose percentage and solids-not-fat. With continued injections, the fat, lactose, and solids-not-fat generally declined to low levels. There was much irregularity from day to day, but it did not occur earlier than the fifth day, and in one of the animals injected daily for 24 days the effects were not produced. The extract produced cystic ovaries in all of the four cows injected, and mummified fetuses were removed from two of the three pregnancies which followed the injection periods. The fat content of the milk of an ovariectomized ewe and a freemartin heifer was increased by injections of the extract, thus indicating that its effects are not ovarian.

The influence of a synthetic thyroprotein when fed to dairy cows over a three-week period, R. P. REECE. (N. J. Expt. Stas.). (*Jour. Dairy Sci., 27 (1944), No. 7, pp. 545–550*).—During a 3-week experimental period of feeding 10 gm. of Protamone daily to five dairy cows in declining stages of lactation and variable stages of gestation, the butterfat content of the milk was increased from 3.62 to 4.11 percent. The average milk production was increased from 23.3 to 25.0 lb. per day. Losses in body weight were slight and heart rate increases were moderate. Solids-not-fat did not appear to be affected. The changes in body weight and quantity and quality of milk produced during the 3 experimental weeks were compared with the 2 weeks before the Protamone was fed.

Rumen synthesis of the vitamin B complex as influenced by ration composition. C. C. LARDINOIS, R. C. MILLS, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 7, pp. 579–583*).—The rumen contents of a cow and a calf after 1 mo. on rations of timothy hay with and without urea and with and without corn molasses or starch or casein were assayed for the vitamins of the B complex. Additions of urea to the ration as a source of nitrogen definitely increased the synthesis of nicotinic acid, biotin, riboflavin, and pantothenic acid in the bovine rumen when a readily available carbohydrate was present. Pyridoxine and folic acid were not closely correlated with the composition of the ration. Thiamine is probably synthesized but destroyed or absorbed at a faster rate, accounting for the variation in the thiamine in the rumen contents.

Ascorbic acid content of cow's milk after five years of continuous lactation, A. D. HOLMES, F. TRIPP, E. A. WOELFFER, and G. H. SATTERFIELD (*Food Res., 7 (1942), No. 5, pp. 370–372, illus. 1*).—After a continuous lactation period of over 5 yr., a Holstein cow established an unusual record in that she produced milk with an ascorbic acid content of 24.91 mg. per liter, as contrasted with an average of 18.17 mg. per liter for 337 samples of milk from a herd on the same ration.

Conserving the vitamins in milk, K. G. WECKEL. (Univ. Wis.). (*Milk Dealer, 33 (1943), No. 3, pp. 36, 38*).—A brief and general discussion of methods.

Laboratory control of milk a present-day "must," R. S. BREED. (N. Y. State Expt. Sta.). (*Canad. Dairy and Ice Cream Jour., 23 (1944), No. 5, pp. 27–29, 68*).—The need for laboratory control of milk is emphasized as preventing the spread of diseases and maintaining proper quality and standards of control. Laboratory tests seem necessary to locate mastitis milk and the adequacy of pasteurization practices.

Manual for milk and cream testers in Maryland, C. W. ENGLAND (*Maryland Sta. Bul. A30 (1944), pp. 93–135+, illus. 13*).—Information of a general nature is given on the composition and physical and chemical properties of milk and cream and their components, with descriptions of sampling methods and details of the procedure used in conducting the Babcock test. Specifications for Babcock glassware and the text of the dairy inspection law of Maryland are appended.

Producing quality milk and cream, R. N. Davis and W. H. Riddell (*Arizona Sta. Bul. 193 (1944), pp. 17+, illus. 11*).—Milk with a low bacterial count was produced by weekly dismantling of the milking machine. The use of a chlorine rinse previous to milking does not seem necessary if a supply of clean water is available. The average bacterial count of milk per cubic centimeter was 6,502 when the machine was dismantled weekly, 5,341 when rinsed with tap water, 5,841 when rinsed with chlorine solution, and 5,916 in August milk when the machine was rinsed with cold water.

Water supplies of butter manufacturing plants, R. T. Corley, H. F. Long, and B. W. Hammer. (Iowa Expt. Sta.). (*Canad. Dairy and Ice Cream Jour., 23 (1944), No. 5, pp. 31–33, 68*).—Water supplies of butter plants must meet public health requirements and be free from butter-spoilage organisms. A bacteriological study of 436 water samples used in 70 butter factories showed that 22 samples contained *Pseudomonas putrefaciens.* Spoilage in unsalted butter washed with water from these samples and stored at 21° C. for 7 days was produced in 19 lots. The spoilage was evident in 4 days or less in 11 of the lots. Of the 436 water samples, 105 gave typical fluorescent colonies on T. G. E. M. agar plates held at 21° for 96 hr., and of these colonies, 97 produced flavor defects in unsalted butter held for 7 days at 21°. A number of samples of water seemed to contain *P. fragi.* Unsalted butter washed with one of the water samples developed a potato odor in 4 days and yielded *P. graveolens. P. mephitica,* which produced a strong odor in unsalted butter, was isolated from one sample. Bacteriological standards for butter wash-water supplies are suggested.

Retention of mold fragments by butter, buttermilk, and wash water during manufacture of butter, P. R. Elliker. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 7, pp. 563–569*).—Estimation was made of the total combined lengths of mold fragments in butter, buttermilk, and wash water by methods previously described (E. S. R., 91, p. 462) and modifications of them. The results showed that butter usually retained more than 50 percent of the total length of the mold filaments but that the wash water contained a small percentage. Most of the bacteria of the original cream were in the buttermilk and not in the butter. Similar results were obtained for butter churned under laboratory and commercial conditions.

Compressing spray-dried milk to save shipping space, B. H. Webb and C. F. Hufnagel. (U. S. D. A.). (*Food Indus., 15 (1943), No. 9, pp. 72–74, illus. 3*).—In a series of tests the effect of compression on the density of dried skim and whole milks was determined. Milks subjected to different manufacturing conditions varied widely in their compression characteristics, the amount of space saved varying from the average values reported by ± 8 percent for skim milk and ± 6 percent for whole milk. Dried skim milk did not form a cake as well as the dried whole milk. The former at a normal moisture content required a pressure of at least 2,400 lb. per square inch to form a definite cake and about 3,200 lb. per square inch to form a cake that would retain its shape well. Cakes of skim milk pressed at 3,200 lb. and of whole milk pressed at 2,400 lb. could be crushed readily to form a powder with a rolling pin, and when thoroughly crushed could be reconstituted with water as easily as the original powder.

Vigorous jolting also served to reduce the space occupied by milk powder. The space saved by jolting small packages of dried skim milk and dried whole milk to densities of about 0.82 and 0.69, respectively, was 27 and 21 percent, respectively. Bulk containers were less readily packed to higher density by jolting, a density of 0.70 being about the maximum attainable with space savings of from 7 to 18 percent. In general, savings in shipping space by compression or jolting were estimated approximately as 31, 38, and 42 percent savings with compression in the die at 1,000, 2,400, and 3,200 lb. per square inch, respectively; 21 percent savings with compression

in small packages at 500 lb. per square inch; and 24 and 11 percent savings by jolting in small and bulk packages, respectively.

Characteristics of some bulk and some commercial consumer-size containers packed with spray-dried skim milk are reported. These indicated that "the rectangular package yields maximum package volume per unit of shipping space. The 30-gal. paraffin-lined tight oak barrel for bulk shipments of dry milks affords strength, buoyancy, moisture- and possibly gas-tightness, and ease of handling. It is the best nonmetallic bulk package for dry skim milk under severe weather and handling conditions and may also be suitable for dry whole milk." Dried skim milk packed in these barrels to a density of 0.75 to 0.80 remained uncaked and in excellent condition and showed only 1 percent moisture pick-up after storage of the barrel at 110° F. and 80 percent relative humidity for 4 mo.

Removal of oxidizing factors makes dry whole milk keep, C. D. DAHLE and D. V. JOSEPHSON. (Pa. Expt. Sta.). (*Food Indus., 15 (1943), No. 11, pp. 76–77, illus. 1*).—Whole milk powder prepared by a process that resulted in removal or very great reduction of prooxidant constituents, particularly lecithin, was found to have excellent keeping qualities with only slight staleness developing in 5 months' storage at about 85° F. The process developed involved separation of the cream and churning of the butter which was melted and separated from the curd by filtering. The pure butter oil was recombined by homogenization with the skim milk which had been supercentrifuged. These processes largely removed the lecithin and any other prooxidant that would make the product subject to oxidized or tallowy flavor. The process was completed by concentrating the homogenized milk in the vacuum and drying on an atmospheric roller drier.

Ice cream body-building with limited milk solids, P. H. TRACY and H. PYENSON. (Univ. Ill.). (*Ice Cream Trade Jour., 39 (1943), No. 7, pp. 12–14, 57–59*).—Consideration is given to the use of certain cereal flours as substitutes for portions of the milk solids-not-fat in ice cream. The viscosity of the mixes was increased and the body of the ice cream was improved because of the high starch content of most of the flours. The amounts of the flours added should be limited to 1 to 3 percent. In general, wheat flour had less effect on flavor than oat or soybean flour. With the exception of those flours that had vegetable fat, salt, and lecithin added, all flours slowed whipping when gelatin was used as a stabilizer. The comparisons included ice creams made with 1.5 percent soybean, wheat, Avenex, oat flour, and Cincrose and 0.5 and 1 percent of certain of these products with and without other variations in the mixes. The flours studied were not a serious source of bacterial contamination. They varied from 7.1 to 13.5 percent moisture.

Alamalt ice cream, A. D. BURKE. (Ala. Polytech. Inst.). (*Ice Cream Rev., 27 (1944), No. 12, pp. 26, 46*).—Alamalt ice cream is made with flour from Alabama yams carefully baked and toasted to bring out a characteristic flavor. A sample of ice cream with 2 percent alamalt was especially desirable, the color good, and melting properties satisfactory. Ice cream containing 2.5 percent alamalt was less desirable and had a slight potato flavor.

Lactose and its utilization: A review, E. O. WHITTIER. (U. S. D. A.). (*Jour. Dairy Sci., 27 (1944), No. 7, pp. 505–537*).—A review is presented of the chemical and physical properties of lactose, its method of manufacture, and its hydrolytic, pyrolytic, oxidation, hydrogenation, and fermentation products, and 327 literature references are given.

VETERINARY MEDICINE

[Veterinary studies in Florida] (*Florida Sta. Rpt. 1943, pp. 55, 58*).—The death of several purebred Brahman bulls on a range in Pasco County during the fall of

1942 was attributed to eating foliage of *Lantana camara,* an ornamental plant that had become established in the pasture.

In connection with a control and eradication program for infectious bovine mastitis, a process of suspending sulfanilamide in plain or iodized mineral oil has been developed which results in a preparation suitable for injecting into the udder. "Intramammary injections of sulfanilamide suspension have proved this drug to be a valuable chemotherapeutic agent for streptococcic mastitis in lactating or dry udders and in acute or chronic infections. Outbreaks of acute infectious mastitis may be reduced to a low incidence within a comparatively short period by application of this program".

Vattenbelastningsprov som hjälpmedel i den kliniska diagnostiken (The water-loading test as an auxiliary method in clinical diagnostics), S. Nilsson (*Skand. Vet. Tidskr., 34 (1944), No. 1, pp. 26–52, illus. 7; Eng. abs., pp. 50–51*).—The author concludes that "in this test, we possess a good auxiliary diagnostical method. When it is employed as a test of the functioning of the kidneys in horse and dog, one can diagnose a kidney insufficiency at a very early stage in a very simple way and without any complicated laboratory investigations, and one can also decide if it is a question of a slight or a severe insufficiency in the kidneys. The test is of very great assistance in diagnosing chronic nephritis and sclerosis of the kidney. An additional advantage obtainable by the test is that by its help one can get not only a good idea of the functioning of the kidneys but also, in the absence of kidneys insufficiency, a good directive for judging other diseases attendant on polydipsia."

The need of a supplementary careful investigation is pointed out, together with some sources of error and the disadvantage due to the necessity of taking many urine samples.

Factors to be considered in conditions causing clinical manifestations of central nervous disturbances, H. E. Biester and L. H. Schwarte. (Iowa State Col.). (*Vet. Med., 39 (1944), No. 8, pp. 303–307, illus. 5*).—The factors discussed as warranting consideration in making diagnoses of central nervous diseases include the following: Viruses—encephalomyelitis, rabies, pseudorabies, and some forms of avian leucosis; bacteria—listerellosis, botulism, pasteurellosis, and pyogenic infections; toxins of unknown origin—leucoencephalomalacia, so-called corn stalk disease of cattle, and silage poisoining of horses; nutritional deficiencies; and miscellaneous conditions.

Comments on immunity to virus diseases, T. Francis, Jr. (*Yale Jour. Biol. and Med., 16 (1944), No. 5, pp. 401–413*).—"In this discussion an attempt has been made to present a view of the functioning of neutralizing antibodies in terms of the dynamics of the different virus diseases; to indicate why in certain diseases the presence of circulating antibodies is associated with prolonged immunity and in others with transient resistance. The mode of infection, the character of the disease, the availability of antibodies at the portal of entry, and the homogeneity of virus strains must be placed in perspective in an evaluation of their rôles. With proper consideration of these factors a sense of order tends to appear in which neutralizing antibodies occupy a prominent position. The concept that the duration of immunity is determined by the continued presence or absence of virus in the recovered animal seems more difficult to support in the light of present knowledge than is an interpretation in which the deciding influence is assigned to the availability of antibodies."

Studies on a virus disease originating in a guinea pig injected with ticks (Dermacentor andersoni Stiles), F. A. Humphreys, D. E. Helmer, and R. J. Gibbons (*Jour. Infect. Diseases, 74 (1944), No. 2, pp. 109–120, illus. 1*).—Observations on an unidentified filtrable virus infection are described which suggested that the infection originated through the medium of *D. andersoni.* The virus was highly pathogenic for guinea pigs, moderately so (according to Steinhaus) for white mice

and probably monkeys, but relatively nonpathogenic for the ground squirrel (*Citellus richardsonii*), fitch (*Putorius foetidus*), white rat, hamster, rabbit, mule deer (*Odocoileus hemionus*), and horse. The great majority of infected guinea pigs die, but the few that recover prove solidly immune to subsequent exposures.

Neutralization of the virus is brought about rapidly in vivo by recovered guinea pigs, and also by certain nonsusceptible animals that have had a previous exposure. In vitro at 37° C. the virus is neutralized by the serum of immune guinea pigs in 18 hr., but not at room temperature in 24 hr.

The virus may be maintained indefinitely by serial passage in the embryonic tissues of the developing chick. Immunity may be induced in a certain, but small, percentage of guinea pigs by means of formalized spleen tissue vaccine.

Penicillin, its possible uses in veterinary medicine, J. L. DAVIDSON (*Vet. Med., 39 (1944), No. 8, pp. 301–302*).—From this discussion it is concluded that "when this drug is made available to the veterinary profession its cost may prevent its extensive use in large animals, but it will undoubtedly be widely used by the small animal clinicians. It is a therapeutic agent to look forward to in the practice of veterinary medicine."

The action of penicillin on the staphylococcus in vitro, L. A. RANTZ and W. M. M. KIRBY (*Jour. Immunol., 48 (1944), No. 6, pp. 335–343, illus. 2*).—The action of penicillin on staphylococci has been studied in vitro by photoelectric turbidimetric methods. Penicillin is bactericidal for the staphylococcus and causes lysis of the organism. There is a close correlation between the concentration of penicillin and its activity. The number of organisms in the initial inoculum appears to affect the activity of penicillin but the constituents of the culture medium do not. More than one-hundred-fold variations in the sensitivity of strains of staphylococci to penicillin have been demonstrated.

[Studies with phenothiazine] (*Jour. Anim. Sci., 2 (1943), No. 4, pp. 371–372*).—Brief abstracts are given on The Efficiency of Phenothiazine Salt Lick and Drench, by W. T. S. Thorp and W. L. Henning (pp. 371–372) (Pa. State Col.); Phenothiazine and Salt Mixture for Sheep, by R. J. Webb, E. H. Peterson, and W. G. Kammlade (p. 372) (Univ. Ill.); and Phenothiazine for the Control of Stomach and Nodular Worms in Sheep, by J. P. Willman and D. W. Baker (p. 372) (Cornell Univ.).

The therapeutic efficacy of phenyl arsenoxides in mouse and rabbit trypanosomiasis (Tryp. equiperdum), H. EAGLE, R. B. HOGAN, G. O. DOAK, and H. G. STEINMAN (*Pub. Health Rpts. [U. S.], 59 (1944), No. 24, pp. 765–783, illus. 3*).—This paper describes the trypanocidal activity of 54 mono- and di-substituted phenyl arsenoxides with *Trypanosoma equiperdum* in vitro and in vivo, the latter in comparison with representative arsonic acids. The most promising of these compounds as regards trypanocidal activity was the p-$(CH_2)_3COOH$ phenyl arsenoxide.

Control of gram-negative bacteria in experimental animals by streptomycin, D. JONES, H. J. METZGER, A. SCHATZ, and S. A. WAKSMAN. (N. J. Expt. Stas.). (*Science, 100 (1944), No. 2588, pp. 103–105*).—Tests are reported showing the activity of streptomycin in mice infected with *Salmonella schottmülleri* and *Pseudomonas aeruginosa* and in chick embryos infected with fowl typhoid, and its effect on *Brucella abortus* in chick embryos.

Cyanide poisoning and its treatment, G. D. SHEARER and K. C. SELLERS (*Vet. Jour., 100 (1944), No. 5, pp. 92–97*).—Following a discussion of the occurrence of poisoning by HCN and its treatment, especially in the United States (E. S. R., 73, p. 242), experimental poisonings of rabbits and sheep were successfully combated with intraperitoneal injections of $NaNO_2$ and $Na_2S_2O_3$.

The arthropod-borne encephalitides of North America, J. L. HENDERSON (*New Orleans Med. and Surg. Jour., 97 (1944), No. 1, pp. 22–29*).—This is a dis-

cussion of the arthropod-borne encephalitides of North America and the Venezuelan equine type.

Titration of St. Louis encephalitis virus and Jungeblut-Sanders mouse virus in tissue culture, C. H. Huang (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 1, pp. 158–160*).—Continuing studies already noted (E. S. R., 89, p. 728), both the St. Louis encephalitis virus and the Jungeblut-Sanders mouse virus have been successfully titrated in vitro by the use of embryonic mouse brain tissue and with the help of another system consisting of chick embryo tissue and the western strain of equine encephalomyelitis virus.

The transmission of glanders from horse to man, C. D. McGilvray (*Canad. Jour. Pub. Health, 35 (1944), No. 7, pp. 268–275, illus. 6*).—This is a discussion of this disease and its diagnosis. Although widely prevalent in Canada as a disease of horses until 1915, it is believed to have been entirely eradicated.

Om Listerella monocytogenes bakteriologi och om förekomst av listerellainfektion hos djur (On L. monocytogenes bacteriology and the occurrence of Listerella infections in animals), G. O. Wramby (*Skand. Vet. Tidskr., 34 (1944), No. 5, pp. 277–290; Eng. abs., pp. 289–290*).—These studies indicate that there are several antigenous factors in addition to those reported by Paterson (E. S. R., 81, p. 571). It is also concluded that in cattle, too, *Listerella* (= *Listeria* (E. S. R., 83, p. 541)) infection in the uterus is far more common than has been previously supposed. In addition to a cow which was suffering from metritis together with general *Listeria* infection, the microbe has been demonstrated in three aborted calves and in two secundines from cows that had aborted. In addition there were two young calves where intrauterine *Listeria* infection could not be excluded.

Listeria infection as the cause of mastitis in cattle, said never to have been described previously, was demonstrated in acute form "in the two posterior udder quarters with pure cultures of *L. monocytogenes* in the milk which contained rich amounts of inflammation products."

Listeria bacteria displayed full vigor after being kept for 8 weeks in a 20-percent NaCl solution at 4° C.

A new Salmonella type with hitherto undescribed somatic antigens, P. R. Edwards and H. Hughes. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 56 (1944), No. 1, p. 33*).—*S. inverness,* a new *Salmonella* type isolated from a normal food handler, is described. It possessed a hitherto undescribed somatic antigen and was assigned the antigenic formula XXXVIII: k–1,6 . . .

A new Salmonella type isolated from man and fowls, P. R. Edwards and H. Hughes. (Ky. Expt. Sta.). (*Jour. Bact., 47 (1944), No. 6, pp. 574–575*).—A new *Salmonella* type, variety *concord,* whose antigenic formula is VI, VII:1, v–1,2,3 . . . is described. It was represented by four cultures of which three were isolated from fatal infections in chicks and one from the stools of a person affected with gastroenteritis.

Studies of toxicity of wild winter peas (Lathyrus hirsutus) for cattle, R. S. Sugg, B. T. Simms, and K. G. Baker. (Ala. Polytech. Inst., U. S. D. A., and Ala. Expt. Sta.). (*Vet. Med., 39 (1944), No. 8, pp. 308–311, illus. 3*).—Following the appearance of a peculiar and rather characteristic lameness in several herds of cattle grazing late in the spring of 1941, 1942, and 1943 on Alabama pastures containing *L. hirsutus* in the blooming or seed-forming stage, studies of the toxicity of this plant were instituted. A single heifer showed these symptoms after being fed for 5 days on an exclusive diet of these plants in the flowering and seeding stage. Steers grazed continuously on *L. hirsutus* for more than 5 mo. did not develop symptoms until the plants bloomed and formed seed pods. All affected cattle observed made apparently complete recoveries even when they continued eating these plants. Cattle fed *L. hirsutus* as hay did not develop any untoward symptoms.

Milker's nodule, M. T. GREEN (*New Orleans Med. and Surg. Jour., 97 (1944), No. 1, pp. 13–14*).—These lesions, occurring on the fingers, single and isolated, are described. The infectious agent is thought to be a virus. Complete healing, without scar, follows protection by a simple dressing.

Ulcerative lesions of the bovine rumen and their possible relation to hepatic abscesses, H. A. SMITH. (Colo. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 234–242, illus. 4*).—A variety of pathologic lesions in the rumens of beef cattle is described. It is suggested that all of these represent a series of steps in the development and healing of superficial ulcers. Various data are presented and discussed by comparing the incidence of these ulcerative lesions with the incidence of hepatic abscesses in a series of 1,807 animals. "The evidence presented tends strongly to justify the belief that there is a definite relationship between ulcers of the rumen and abscesses of the liver in beef cattle."

The production of parturient hemoglobinemia by low phosphorus intake, D. E. MADSEN and H. M. NIELSEN. (Utah Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 808, pp. 22–25, illus. 1*).—A case of parturient hemoglobinemia with all of the characteristic syndrome was produced by feeding a high producing dairy cow a ration made up largely of alfalfa hay and dried beet pulp. "While all of the factors in connection with the etiology of this disease are not known, this experiment seems to show with reasonable certainty that the characteristic hypophosphatemia was the result of low phosphorus intake and was in some unexplained manner responsible for the erythrocyte destruction."

Mastitis infections and their relation to the milk supply, R. S. BREED. (N. Y. State Expt. Sta.). (*Jour. Milk Technol., 7 (1944), No. 3, pp. 143–155, illus. 7*).—This address before the Vermont Dairy Plant Operators and Managers' Association discusses the complicated nature of mastitis, the various organisms that produce it, and its relations to other contagious milk-borne diseases.

Control of bovine mastitis involving the supernumerary teats and glands: A case report, W. G. ANDBERG and F. J. WEIRETHER. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 808, pp. 26–27*).—A number of cases of infected supernumerary teats and glands are reported. While, in most instances, treatment is simple and effective, "from a practical standpoint supernumerary teats should be removed early in life when the operation is a minor one."

Penicillin in the treatment of bovine mastitis, J. C. KAKAVAS. (Univ. Del.). (*North Amer. Vet., 25 (1944), No. 7, pp. 408–412*).—According to this preliminary report, "the infusion of crude penicillin into the udder may induce local tissue reaction. The degree and duration of the reaction will depend upon the type of medium in which the crude penicillin is produced. Corn steeping liquor medium gives very severe local tissue reaction, whereas whey-broth medium induces very mild or no reaction.

"The crude penicillin appears to be very effective against streptococcic mastitis and to a lesser degree against staphylococcic mastitis.

"The infusion of sodium penicillin solution into the udder produced no unfavorable local or systematic reactions. The results obtained from the limited cases reported in this study warrant the view that sodium penicillin solution has promising chemotherapeutic value in streptococcic and staphylococcic mastitis.

"Since penicillin is ineffective against Gram-negative bacillary infections such as the coliform group that is encountered in mastitis, it is important that bacteriological diagnosis be made before this product is used."

Diagnosis of pyelonephritis in cattle, E. S. FEENSTRA and F. THORP, JR. (Mich. Expt. Sta.). (*North Amer. Vet., 25 (1944), No. 7, pp. 405–407, illus. 4*).—Methods which the authors have found practical are described.

Bovine intracutaneous and serological reactions to fractions of Trichomonas foetus (protozoon), M. H. SVEC. (Wis. Expt. Sta.). (*Jour. Bact., 47 (1944),*

No. 6, pp. 505–508.)—To determine whether a serological or a skin test could be developed, a large mass of *T. foetus* cells was grown, fractionated, and the fractions tested for intracutaneous and serological actiivty. The injection of the fractions did not result in skin reactions in any of the cattle tested. The results do not give any hope of developing a serological or skin test for the diagnosis of trichomoniasis in cattle.

Some pathologic-anatomical observations on avian tuberculosis in cattle, H. E. Ottosen (*Skand. Vet. Tidskr., 34 (1944), No. 1, pp. 1–25, illus. 6; Swed. abs., pp. 23–24*).—A brief survey is made of previous investigations on the pathologic-anatomical findings in avian tuberculosis in cattle and on the virulence of avian tubercle bacilli for mammals as elucidated through experiments on cattle and guinea pigs.

Description is given of five cases of avian tuberculosis in cattle in which the lesions presented either an extraordinarily wide distribution of the infection, an uncommon localization, or particularly severe local changes. In all five cases avian tubercle bacilli were isolated from one or more of the organs attacked. The strain obtained in one case was somewhat typical in its growth, however, as in certain respects it resembled the bovine type. On appraisal of its virulence on guinea pigs and rabbits it was found to be a little more virulent than are avian strains in general.

Nematode parasitism of sheep, E. R. Doll and F. E. Hull. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 808, pp. 13–21, illus. 1*).—This study indicates that "the control of internal parasitism must be accomplished by a preventive program. In such a program, the three principal measures to be used are adequate nutrition, anthelmintic treatment, and pasture rotation. "The measures for parasite control should be incorporated into a general program for disease prevention. Preventable conditions, other than parasitic infection, account for more cases in our post mortem records than those which are diagnosed as parasitism. The more important of these are malnutrition, pregnancy disease, sporadic pneumonia, navel infection, lamb dysentery, foot rot, overfeeding, tympanites, tetanus, and poisoning. Again, the control measures consist of good management practice, adequate feeding, housing, and reasonable sanitary precautions. Finally, one should guard against overenthusiasm for anthelmintic medication. The anthelmintics must be used to augment rather than replace sanitation, rotation, and good management. Although phenothiazine is remarkably effective against many of the nematode parasites of sheep, it will not remove tapeworms, coccidia, lungworms, and flukes. In addition, there are intestinal nematodes against which phenothiazine is not effective. These latter parasites must be controlled largely by sanitary precautions and preventive measures."

The effectiveness of a 1-to-14 phenothiazine-salt mixture in controlling nematode infection in sheep, E. H. Peterson, W. G. Kammlade, and R. J. Webb. (Ill. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 228–233, illus. 2*).—Following experiments with 2 lots of about 350 ewes and lambs each, it is concluded that, under the conditions, "a 1 : 14 phenothiazine-salt mixture markedly protected the sheep from excessive parasitism when the animals, relatively free from internal parasites at the beginning of the trial, were maintained without directly or indirectly contacting other sheep. The same phenothiazine-salt mixture did not, however, protect sheep when they were placed upon a pasture recently contaminated by parasitized, untreated sheep."

Studies on brucellosis of swine.—I, Infection experiments with weanling pigs, L. M. Hutchings, A. L. Delez, and C. R. Donham. (Ind. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 195–208*).—In this test of methods, 60 pigs were divided into 6 groups of 10 pigs each and exposed to massive doses of a polyvalent serum of six strains of *Brucella suis* by six different routes. Ten other pigs were kept as controls.

"These experiments demonstrated that a high percentage of heterogeneous pigs were readily infected at weaning age with *B. suis* as determined by agglutination and bacteriologic results. . . . These results indicate that the agglutination method, as now employed for brucellosis in swine, is adequate as a herd diagnostic procedure but may not be sufficiently reliable as a basis of diagnosis in individual swine. Gilts infected with *B. suis* as weanling pigs at about 12 weeks of age failed to show the symptom of abortion at the termination of their first pregnancies, and *B. suis* was not recovered from them or the tissues of some of their newborn pigs at the time of parturition."

Streptococcal endocarditis in young pigs, S. HONT and A. W. BANKS (*Austral. Vet. Jour., 20 (1944), No. 2, pp. 206–210, illus. 3*).—Two cases are described characterized by large cauliflowerlike growths on the heart valves of swine. In one the causal organism was a streptococcus identical with or closely related to *Streptococcus fecalis,* and in the other a streptococcus related to the "enterococci". The condition was reproduced experimentally in a young pig by intravenous injection of increasing doses of young broth cultures.

Diagnostic chart of swine erysipelas, J. E. PETERMAN. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 808, pp. 10–11*).—This chart is designed as an aid in the diagnosis of this disease in the field.

Swine erysipelas organisms recovered from a brown rat (Rattus norvegicus), G. W. STILES. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 243–245, illus. 1*).—Recovery of swine erysipelas organisms (*Erysipelothrix rhusiopathiae*) from a diseased female brown rat caught on a dump near the stockyards in Denver, Colo., indicates that "such rodents might transmit the disease from infected hog lots to noninfected premises."

Studies of the spleens of hyperimmunized and immunized swine, A. L. DELEZ. (Ind. Expt. Sta.). (*Amer. Jour. Vet. Res. 5 (1944), No. 16, pp. 250–255, illus. 6*).—Continuing earlier work (E. S. R., 69, p. 718), bacteriological examination of the spleens of over 200 hyperimmunized, immunized, and normal hogs did not show any significant pathogenic organisms in any instance. Gross lesions, typical of cholera, were not present, and there was no evidence that the process of hyperimmunization regularly produces a hyperplasia of the spleen.

Histologically, the spleens of 126 hyperimmunized hogs frequently showed degeneration of the walls of the blood vessels. In 1 lot of 45 spleens there was hyalinization of the walls of the blood vessels associated with extensive necrosis of the splenic pulp and follicles. Hyalin changes also involved the trabeculae in spleens that showed the more extensive lesions. There was no indication that the hyalin material in the spleens of hyperimmunized hogs was amyloid.

Histologically, the spleens of recently vaccinated pigs, examined from 1 to 4 weeks following vaccination with antiserum and virus, showed no evidence of hog cholera lesions. The spleens of 7-month-old hogs that were vaccinated with serum and virus at 2 mo. of age had a normal histological structure.

A Salmonella choleraesuis bacteriophage in swine feces, C. N. DALE, H. MERIWEATHER, and H. W. SCHOENING. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5, (1944), No. 16, pp. 279–281*).—Tests for the presence of bacteriophage for *Salmonella* in the feces of 134 swine were positive in many cases and negative in others. It is thought that the inhibitory action of bacteriophage may be responsible for negative findings as to *Salmonella.* The results also suggest that the extent to which *S. choleraesuis* is capable of producing disease in swine may be modified by the presence of bacteriophage.

Purification and character of the swine-influenza virus, A. R. TAYLOR, D. G. SHARP, I. W. MCLEAN, JR., D. and J. W. BEARD, J. H. DINGLE, and A. E. FELLER (*Jour. Immunol., 48 (1944), No. 6, pp. 361–379, illus. 7*).—This article describes the isolation of a particulate component from the chorioallantoic fluid of chick embryos

infected with the virus of swine influenza. With these particles in the purified concentrates were associated with the hemagglutinative and infectious attributes of the virus-infected chorioallantoic fluid from which the particles were derived, either by absorption on and elution from chickens' red blood cells followed by ultracentrifugation or by ultracentrifugation alone. From electron micrographs the particles appeared to be rounded or ovoid and of variable size. A parallel finding with respect to variation in size was the slightly diffuse boundaries observed in sedimentation-velocity studies. The average diameter of the particles estimated from electron micrographs was 78.3 mμ. From the sedimentation-constant, $S_{20^\circ} = 662 \times 10^{-13}$, the density, 1.18, determined by pycnometric measurement, and the assumption of spherical shape, the average diameter of the particles was 81.5 mμ. Chemically, the particles were a complex of lipide (24.0 percent), and nonlipide, carbohydrate and protein (77.76 percent) containing, on the basis of nonlipide-phosphorus content, about 4.8 percent nucleic acid, probably of the desoxypentose type. The total carbohydrate content was 10 percent, an amount greatly in excess of that which could have been present in the nucleic acid.

Vesicular stomatitis in swine, E. F. Sanders and A. H. Quin (*North Amer. Vet., 25 (1944), No. 7, pp. 413–418, illus. 3*).—In this report of what is thought to be the first naturally occurring outbreak of vesicular stomatitis in swine in the United States, the authors outline symptoms and lesions nondifferentiable clinically from foot-and-mouth disease or vesicular exanthema. In this outbreak, involving some 1,500 swine, the disease was limited, with one exception, to heavy, hyperimmune, garbage-fed hogs. About 50 percent of these hogs developed the disease, with a mortality, including those showing secondary infections, of not over 2 percent. The development of positive, classical vesicles in cattle, swine, guinea pigs, and horses definitely identified in virus as that of vesicular stomatitis.

Following caustic soda-cresol disinfection of the quarantined premises, under official supervision, a lot of 120 contact swine remained healthy after pen contact when introduced 7 days after the disinfection.

Acute uremia associated with "uric acid infarcts" in the kidneys of baby pigs, L. L. Madsen, I. P. Earle, L. C. Heemstra, and C. O. Miller. (U. S. D. A.) (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 262–273, illus. 5*).—Acute uremia was diagnosed among the unusually large number of baby pigs dying during the 1942 and 1943 farrowing season at the Beltsville (Md.) Research Center and vicinity. Evidence is presented which indicates that 45–50 percent of the baby pigs dying within the first 9 days of life during the spring and fall farrowing season of 1943 were affected with this condition.

Typical cases of uremia had a considerable amount of orange-colored precipitate in the kidneys, ureters, and urinary bladder. Such cases showed a marked elevation in blood urea nitrogen and uric acid and a marked increase in uric acid in the kidney tissue. Blood sugar might be within the normal range or much lower than normal. Withholding food entirely or limited feeding of baby pigs in preliminary work has resulted in the production of a condition that is very similar to acute uremia as encountered under herd conditions.

Studies on factors influencing the health of pigs.—II, The incidence of the roundworm (Ascaris lumbricoides) in pure-bred bacon pigs in Canada, with observations on age of susceptibility and effects on growth, L. P. E. Choquette and W. E. Swales (*Canad. Jour. Res., 22 (1944), No. 3, Sect. D, pp. 53–59*).—Infections with *A. lumbricoides* were found in approximately 75 percent of 1,090 pure-bred pigs surveyed at Advanced Registry Pig Testing Stations in four provinces of Canada. Most of these infections were acquired during the preweaning period. They were not highly pathogenic in pigs over 2 mo. old if kept under good conditions of nutrition and housing.

Serological investigations of horses suffering from strangles (Adenitis equorum), O. GRINI (*Skand. Vet. Tidskr., 34 (1944), No. 5, pp. 257–266; Ger. abs., p. 266*).—By means of the fixation test the presence of complement-fixing antibodies in the blood of horses suffering from strangles can be demonstrated. A HCl extract of the streptococci is employed as antigen. This antigen was found to give a distinctly positive reaction with the ordinary strangles convalescent serum and with serums from patients suffering from strangles.

Phenothiazine as an anthelmintic in horses, J. W. BRITTON. (Univ. Calif.) (*Vet. Jour., 100 (1944), No. 5, pp. 102–106*).—"The available literature on the use of phenothiazine as an equine anthelmintic has been reviewed, with special emphasis on toxicology. Apparently increased oxidation and absorption of the phenothiazine derivatives accounts for the observed symptoms. Phenothiazine poisoning can be kept at a minimum by employing doses no larger than 30 gm./1,000 lb., thorough preparation of the horse with several bran mashes prior to treatment, and the use of small repeated doses in weak emaciated anemic horses."

Agglutination of antigens from distemper-infected dogs and ferrets by anticanine-distemper immune sera, A. J. WEIL, F. POPKEN, and J. BLACK (*Jour. Immunol., 48 (1944), No. 6, pp. 355–359*).—Organs and body fluids of dogs and ferrets experimentally infected with the virus of canine distemper were found to contain an antigen that reacts specifically with an antibody present in the serum of immunized and hyperimmunized dogs. The antibody-antigen reaction was demonstrated by the agglutination of heat-killed suspensions of *Bacillus prodigiosus* that had been in contact with the organ extracts or the body fluids of infected animals.

The isolation of Salmonella anatum from the feces of a dog, J. E. CRAIGE (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 808, pp. 33–34*).—*S. anatum* was isolated from the feces of one of two dogs showing diarrhea and encephalitic symptoms. Both dogs recovered promptly after treatment with sulfaguanidine. Theories of possible pathogenesis are advanced. The public health significance of this finding is mentioned.

Trombicula autumnalis Shaw and its association with seasonal pruritus in the dog, J. S. STEWARD (*Vet. Rec., 55 (1943), No. 30, pp. 289–290, illus. 3*).—*T. autumnalis* has been found to be responsible for a number of cases of general pruritis in the dog, and because of its seasonal and rural distribution it is thought that it may frequently cause general pruritis not due to other parasites. A preferred habitat for the mites in the interdigital fossae was found of some diagnostic value.

Soil temperatures and soil moisture as factors in the seasonal incidence of certain animal parasites in Alabama, R. O. CHRISTENSON and H. H. CREEL. (Ala. Polytech. Inst.). (*Jour. Ala. Acad. Sci., 14 (1942), pp. 30–33, illus. 4*).—Graphs are presented showing the blanketing effects of vegetation on the temperatures of Norfolk sand, the temperature-moisture relationships of Sumter clay, and the seasonal occurrence of intestinal helminths of the chicken as indicated by autopsies. It is concluded that "there are two periods of the year when parasite infections reach their maxima in the case of such parasites as *Ascaridia galli* and *Heterakis gallinae,* first during the early-spring growing season expressed by the incidence peak in June, and secondly during the latter part of the summer rainy season, the latter period apparently being of greatest importance. Periodically during the year ecological factors either retard the development of parasite eggs, or are actually lethal to them."

Acquired resistance in chickens, turkeys, and ring-necked pheasants to the gapeworm Syngamus trachea, L. OLIVIER. (U. S. D. A.). (*Jour. Parasitol., 30 (1944), No. 2, pp. 69–76*).—Evidence is presented to show that turkeys, ring-necked pheasants, and chickens developed marked resistance to infection with *S. trachea* as a result of single infections. The resistance in turkeys was tested while worms of the immunizing infection were still in the trachea. Results of the

pheasant and chicken experiments suggest that in these host species the resistance may persist after the immunizing infection has been lost. Turkeys and pheasants of the same age were about equally susceptible to infection. However, the pheasants lost their infection more quickly than did the turkeys. On the other hand, even when very young, chickens were more resistant than either of the other host species. In every case where comparison could be made, the percentage development varied inversely with the number of eggs and larvae administered. This is assumed to indicate that the larger doses induced a more rapid or a stronger response on the part of the host with the consequent elimination of some or all of the worms. Smaller doses induced a milder reaction, and consequently a greater proportion of the worms were able to survive.

The rôle of microörganisms in reproductive disorders of the chicken, E. N. Moore and E. A. Marten. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 256–261*).—Autopsies on 1,051 birds brought to the laboratory showed 274 affected with reproductive disorders. Cultures were obtained from 44.5 percent of these birds. There was little if any significant difference in the type or the incidence of bacteria isolated from birds with or without reproductive disorders. Staphylococci and colon organisms represented 88 percent of the organisms isolated from all birds cultured. These organisms were found in birds with and without the disease, and no significant difference existed between the two groups of birds. It is concluded that staphylococci and *Escherichia coli* were of little or no etiologic significance.

A study of the pathogenicity of isolated organisms showed that 54.9 percent were capable of causing illness or death in the dosage used. Thirteen cockerels receiving inoculations with *E. coli* and 1 given *Salmonella* spp. developed a partial paralysis and general debility within a few days after being inoculated. Of the birds receiving *E. coli,* 34 percent developed this condition. The symptoms and histopathologic findings were not pathognomonic of neurolymphomatosis.

Thirty-six apparently healthy yearling hens were cultured aseptically to determine the normal bacterial flora of birds. The organs cultured were the liver, heart, blood, spleen, and oviduct. None of the hens yielded cultures of staphylococci or *E. coli.*

Twenty-fourth annual report of pullorum disease eradication in Massachusetts, H. Van Roekel et al. (*Massachusetts Sta. Control Ser. Bul. 120 (1944), pp. 12*).—In further eradication work (E. S. R., 90, p. 396), during the 1943-44 testing season 762,066 birds were tested in 413 flocks, of which 94.64 percent were in 386 nonreacting flocks. The percentage of positive tests was reduced from 0.48 to 0.11.

A report on Pasteurella pseudotuberculosis infection in turkeys, A. S. Rosenwald and E. M. Dickinson. (Oreg. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 246–249*).—The isolation of an organism believed to be *P. pseudotuberculosis* from sick or dead turkeys from 10 different flocks in Oregon is reported. It is believed that this organism is concerned with the etiology of the disease noted in these flocks. The infection apparently has not been reported previously in this country.

Salmonella infections in turkeys, B. S. Pomeroy and R. Fenstermacher. (Minn. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 282–288*).—In this work 23 types of organisms belonging to *Salmonella* were isolated from poults. *S. pullorum* was most frequently encountered in a majority of the outbreaks of salmonellosis. *S. typhimurium* was found in approximately 75 percent of the outbreaks that were designated as paratyphoid.

In a group of 30 birds reacting to either or both of the rapid whole-blood method or the test-tube method for pullorum disease, *S. pullorum* was recovered from the internal organs of 14 and *S. newport* from 3. *S. pullorum* was isolated from eggs

laid by 11 of the birds in this group, constituting 8.04 percent of the total number produced by the group.

In a group of 26 birds which gave "fine" aggregates or clumps when tested with tube antigens, *S. pullorum* was recovered from 0.8 percent of eggs examined. *S. newport* was recovered from 2 turkeys and *S. pullorum* from none. Organisms belonging to the Enterobactereaceae were also isolated from the internal organs of several of the turkeys in this group. "These organisms and other closely related bacteria may possess antigens closely related to those of *Salmonella,* and the presence of these infections might tend to complicate the testing of turkeys for pullorum disease."

Bird pox in the sooty grouse (Dendragapus fuliginosus fuliginosus), with recovery of the virus, J. T. Syverton and I. M. Cowan (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 215–222, illus. 9*).—The virus of fowl pox (contagious epithelioma of fowl) was the causal agent of the naturally occurring infectious disease of sooty grouse in the Cowichan Valley of southeastern Vancouver Island, British Columbia. The affected tissues of the diseased grouse readily yielded a virus indistinguishable from a known strain of fowl pox in its pathogenic, histopathologic, and morphologic characteristics. Chickens recovered from an infection with the causative agent of the grouse disease were solidly immune to attempted infection with a massive dose of fowl pox virus. This is said to be the first time that the sooty grouse has been implicated as a natural host for the virus disease, fowl pox.

AGRICULTURAL ENGINEERING

Postwar opportunities for agricultural engineers in soil and water conservation, T. B. Chambers. (U. S. D. A.) (*Agr. Engin., 25 (1944), No. 6, pp. 209–212, illus. 2*).—Among the fields of opportunity discussed are those of the land-capability survey of some 315 million acres, of which only 50 million acres are class 1 lands which can be farmed safely without special practices; rehabilitation or improvement of distribution systems supplying water to 11,700,000 acres; control of reservoir siltation; general soil-conservation measures applied by the district and the single farm, etc. A feature of the paper is a summary of the replies of farmers in four Southern and Southwestern States to questions on the value to them of conservation measures applied on their own property and to related questions. Of those replying, 3,716 found the conservation measures applied to be effective against erosion, as compared with 40 who did not; 3,664 obtained increased production by using such measures, as against 92 who did not, etc. Tables of cropland possibilities of land in farms in the United States according to land-use capabilities and of land-use capability classes of land in farms of the United States suitable for crops are also included.

A rainfall applicator, W. D. Ellison and W. H. Pomerene. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 6, p. 220, illus. 3*).—The applicator here described consists of a water tank; an overflow weir which controls the depth of water in the tank; holes, reamed to 0.042-in. diameter, in the bottom of the tank, through which water drips in the first stage of applied rainfall; an interchangeable screen which intercepts this water and causes drops of the desired sizes to form on a plane parallel to the soil surface; a motor which keeps this screen in motion so that drops will be well scattered over the soil surface; and a curtain which may be drawn across the plat to stop the rainfall. The screen is made of chicken wire covered with cheesecloth, placed loose so that it will depress and sag in each opening of the wire. Raindrops are formed on short lengths of wool yarn which hang from the cheesecloth at the center of each depression. This screen is hung parallel to the surface of the test plat.

The intensity of the artificial rainfall is controlled in part by varying the head in the tank, in part by inserting small wires into the outlet holes in the bottom of the tank. Intensity did not vary more than about ± 3 percent from one run to another. Raindrop size is controlled by the screen. Chicken wire with 1-in. openings and small-size wool yarn were used to make small drops, and wire with 2-in. openings and large-size wool yarn to make larger drops. Two drop sizes, 3.5 and 5.1 mm., were used in Coshocton, Ohio, experiments, but other sizes could be developed. Drop sizes were found to vary only about ± 6 percent. Drop velocities are controlled by raising or lowering the screen. In operations at Coshocton, it was found most convenient to keep the screen attached to the tank and raise and lower screen and tank together. The velocities which the different sizes of drops will acquire when falling from the different heights can be taken from Laws' curves (E. S. R., 86, p. 739).

Legislation for drainage construction and maintenance, L. A. Jones. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 6, pp. 223–224, 236*).—The author briefly outlines the history of drainage laws, of which the first in this country were enacted about 200 yr. ago. In a somewhat fuller account of current procedure in the establishment and operation of such laws and of the drainage districts created under them, he points out certain improvements needed in the general organization procedure in the drainage districts and discusses, as an illustration of a drainage law well adapted for the organization and operation of small drainage districts, the Maryland law of 1941. Federal assistance in the setting up of drainage projects similar to that given to irrigation projects for the past 35–40 yr. is considered desirable, and bills for this purpose now pending in both houses of Congress are noted. Faulty administration rather than inadequacies in the laws themselves is held to be the cause of much of the difficulty, delay, and neglect of maintenance found in connection with drainage enterprsies.

How to determine the drainability of soils, R. L. Patty. (S. Dak. State Col.). (*Agr. Engin., 25 (1944), No. 6, pp. 221–222, illus. 2*).—The author proposes determining soil components by a hydrometer method essentially the same as that of Bouyoucos (E. S. R., 57, p. 710), taking the readings in such a manner as to include the finer silt with the clay in a fraction designated "clay colloids." All soil material remaining in suspension after 15 min. was included in this clay colloids fraction. It is stated that this measurement "will give the drainage engineer a surprisingly close drainability rating for the soil. However, the complete analysis of the soil, which gives him the total silt and total clay and also the very fine clay will furnish a further check and assurance for his diagnosis. In the case of a few soils it will possibly modify his rating of the soil to a slight degree. But the clay colloids in the soil will be the most significant figure in rating its drainability." Solutions of sodium hydroxide and of sodium oxalate (concentrations not stated) are indicated as the deflocculating agents used. Samples of 50 gm. of oven-dried soil are specified. The material remaining in suspension after 1 hr. is determined as clay. A tabulation of the analyses of three soils for rammed-earth construction work gives percentages of total sand, total colloids, conventional clay, very fine clay, and conventional silt. Interpretation of the analytical figures in terms of drainability is discussed briefly, together with the possibilities of a more elaborate development of the method.

Agricultural engineers in malaria research and control, F. W. Knipe (*Agr. Engin., 25 (1944), No. 6, pp. 217–219*).—The drainage of swamp areas, often potentially available land from the agricultural viewpoint, is one of various measures both necessary for malaria control and also of interest to the agricultural engineer. Experiments with intermittent irrigation of rice, to kill the mosquito larvae by the brief drying-up periods were successful in India, both in destroying the malaria vector and in maintaining as good a yield and quality of the crop as had been produced under continuous flooding. These experiments covered 2 yr. of preliminary plat

experiments and 2 yr. of practical field tests. Other water manipulation and operations involved in the prevention of mosquito breeding are also noted. The "mosquitoproofing" of rural homes and provision of improved insecticidal equipment are further malaria-control measures which are deemed to fall within the province of the agricultural engineer.

Mechanical farm equipment (*Maryland Sta. Rpt. 1943, pp. 8–9*).—In curing and storing sweetpotatoes electric strip heaters under a slatted floor provided the most uniform temperature with the least work, but at the highest cost. Finned strip heaters used less power than plain strip heaters and showed less rusting, as they operated at lower temperatures. Except for small, well-insulated houses, it is doubted whether electric heat would be practical so far north. Hot-water pipe radiators under a slatted floor provided quite uniform conditions, but required more attention when hand operated. Coal stoves, whether bare or jacketed, produced high ceiling- and low floor-temperatures and were harder to control.

A mechanical egg cooler was tested under farm conditions in a well-ventilated building similar to a feed room. Fifteen doz. eggs could be cooled from 95° F. to below 60° in 1 hr. in the cooler, but they condensed moisture from the air as soon as they were removed from the cooler. Such wet eggs can not be cleaned satisfactorily.

A laboratory model of a multistage dehydrator has been constructed and used very effectively in determining important factors in commercial dehydration of several fruits and vegetables.

A native grass seeder, H. G. PORTERFIELD. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 630–635, illus. 4*).—For sowing very chaffy seed mixtures over rough land a broadcast seeder was developed, which will operate successfully over extremely rough sand sage brush land and hummocked fields. When this seeder was followed by a disk harrow satisfactory stands of native grasses were obtained over a wider range of terrain and with chaffier seed mixtures than had previously been practical. The cost of this equipment was very moderate. Grass seed harvested with a grain combine requires no recleaning or processing before seeding, which greatly reduces seed cost and makes it practical for a farmer to harvest and plant his own seed.

The distribution of the seed is effected by a horizontal fan. The size and speed of this fan and the density of the seed used largely determine the distribution spread obtained. With the equipment shown, a spread of from 14 to 20 ft. could be obtained with most grass seed. By using a fan of this type, it is practical to feed seed and seed mixtures onto the fan from several hoppers and at varying rates. A drawing representing some detail of a barrel hopper, feed openings, and fan, shows a fan of four upright blades 4 in. in height and 36 in. in diameter. The fan is mounted centrally under a 55-gal. oil drum having two opposite sectors cut out from its bottom to serve as feed openings, pivoted, sector-shaped covers with handles for controlling the effective size of the openings, and an agitator 18 in. in diameter and of two blades mounted upon a central shaft inside the drum. The capacity of the hoppers used and their feed mechanism may be selected to fit the requirements of individual seed material. Three hoppers are shown, but the number that may be used need be limited only by the space available on which to mount them and by the capacity of the fan.

Home-built electric dehydrator (*U. S. Dept. Agr., 1944, AWI–76, pp. 11+, illus. 21*).—This publication contains a bill of materials, complete working drawings, including cutting plans, and full construction directions for a dehydrator with centrifugal fan air circulation, four 300-w. heating elements of the screw-in type, and maximum capacity of 16 lb. distributed on eight trays, the fan to be driven by a ¼-hp. portable motor. Construction is mainly of ¾-in. lumber and of ⅜- and ¼-in. plywood, the scarce materials called for being limited to shaft, hardware, wiring

materials, and thermostat. Directions both for operating the dehydrator and for preparing, drying, and packaging various fruits and vegetables follow the constructural detail.

Sweet potato dehydration, H. T. Barr and L. E. Morgan. (La. Expt. Sta.). (*Agr. Engin., 25 (1944), No. 6, pp. 213–214, 216, 219, illus. 2*).—The authors discuss the methods and costs of production of sweetpotatoes with reference, especially, to means of removing the vines, digging, and gathering up the crops.

With respect to dehydration, it is noted that the dried product takes up about one-third of the space needed for the fresh, that the dried sweetpotato feed will keep for 2 yr. without appreciable loss, and that cheaper storage can be used for the dehydrated material. Dehydration tests have been made at the Louisiana State University on single-drum, parallel-current rotary driers, but no tests on counter-current rotary driers, although a drier is being constructed for such tests. Very brief descriptions of six driers in use in the State are given.

Farm service buildings: Assets or liabilities, R. Crow (*Agr. Engin., 25 (1944), No. 6, pp. 215–216, illus. 1*).—The author points out various ways in which farm buildings are likely to be so designed and built as to fail to pay their costs. A barn, especially, may give so little protection to its contents that it has no real value for this purpose. It may be so inconveniently arranged as to require excessive labor for operation, or it may be so expensively built that the amortization cost is out of line with the profits that it makes. Even a building well and economically designed may fail to pay by being used in farm practices which no equipment can make profitable. One of the examples cited is that of the sale of milk from a herd of scrub cows, where the herd is, in itself a liability, and any structures built for it simply increase that liability. It is advised that information requested by persons not giving adequate details of requirements and intended use be withheld, to avoid encouraging unsuitable building, until fuller statement of purpose and use is furnished. Closer cooperation among various specialists is also urged.

AGRICULTURAL ECONOMICS

A note on the derivation of production functions from farm records, G. Tintner. (Iowa Expt. Sta.). (*Econometrica, 12 (1944), No. 1, pp. 26–34, illus. 1*).—The author uses "as a regression equation a function which is linear in the logarithms," which is the same as that used by P. H. Douglas in his empirical studies.[1] The production functions are derived from business records for 1942 kept at the Iowa State College for 609 Iowa farms divided into four main types—dairy, hogs, beef feeders, and crops. The variables chosen as the measure of total product gross profits were land (measured by number of acres in the farm), labor (measured by number of months of labor), improvements, liquid assets, working assets, and cash operating expenses. The sums of the regression coefficients (elasticities) were beef feeders 0.788, crops 0.770, dairy 1.130, and hogs 0.900. "The elasticity with respect to land is largest for the production of crops. Elasticity with respect to labor is outstanding for dairy and again for hog production. Elasticity with respect to improvements is largest for beef feeders. Elasticity with respect to liquid assets is outstanding in the production of beef. Elasticity with rsepect to working assets is greatest in dairy production and so is elasticity with respect to cash operating expenditure." All branches of farming except dairy production have decreasing returns to scale. Considering the total for the farms, the factors of production in the order of their elasticities were land, liquid assets, cash operating expenses, labor, and improvements. Working assets seem to have only a negligible influence.

Organization and operation of farms with suggested adjustments in the Brown loam area, Mississippi, W. G. O'Leary (*Mississippi Sta. Bul. 384*

[1] The Theory of Wages. New York: Macmillan Co., 1934, pp. 639+, illus. 91.

(*1943*), *pp. 55, illus. 3*).—The study, which is applicable chiefly to the central and southern portions of the area, is based on A. A. A. records for 140 sample farms in four counties and questionnaires sent the farm operators covering classes and numbers of livestock and the value of livestock and livestock products. In the analysis the records were sorted into 14 groups on the basis of the five major types of farms, the tenure in each type group, and the size farm in each tenure group. The general physical and economic characteristics of the area are described. An analysis was made of the pre-war agriculture: Size of farms, tenure of operators, production practices, leasing arrangements, credit practices, and types of farm organization. For the one-family, two-family, and three-family farms, analysis is made of the income from different types of farms, the relation of farm income to employment, need for adjustment in 1941 and kinds of adjustments suggested, and changes in income and employment through adjustments in farm organization and variations in size of business. Tables and charts show suggested changes in crops and livestock and the estimated incomes with the present and alternate organizations, and the monthly labor requirements as related to available labor.

Underemployment resulting from lack of diversification and small size of farms and failure to fully use natural resources are the chief causes of low incomes in the area. Cotton as a supplementary dairy enterprise furnishes year-round employment and the highest farm income. Cotton yields the highest cash return per day of labor, but due to labor requirements the acreage a family can produce and harvest is so limited that it does not yield sufficient income to meet family requirements.

Costs and returns from the laying flock on commercial poultry farms, 1940–41, L. B. Darrah ([*New York*] *Cornell Sta. Bul. 802* (*1943*) *pp. 56, illus. 6*).—This is the second bulletin based on the study previously noted (E. S. R. 90, p. 541). It analyzes the labor requirements, feed costs, mortality, egg production, prices received for eggs, costs and returns, etc., for the heavy- and light-breed laying flocks, and flocks combined, and factors affecting costs and returns. The management practices—laying houses and feeding practices—are discussed.

The average production per layer was nearly the same for both breeds of fowls, 168 eggs, and there was no significant difference in the size of eggs. Market eggs sold accounted for 90.8 percent of the total production and brought an average of 28.6 ct. per dozen. Excluding hatching eggs, the average price for white eggs was 2 to 3 ct. per dozen more than for brown eggs. The labor requirement was 9.5 min. per dozen eggs for the light breeds and 11.2 min. for the heavy breeds. The light breeds used 6.9 lb. of feed, and the net cost of production was 26.3 ct. per dozen eggs for the light-breed flocks with 500–2,400 birds as compared with 7.9 lb. and 30.5 ct. for the heavy-breed flocks. The return per hour of labor for the entire poultry business was 61 ct. on farms with light breeds and 53 ct. for those with heavy breeds. Cost of production per dozen eggs was 3.5 ct. higher in the Hudson Valley than in the central part of the State. Labor return per dozen eggs increased for heavy-breed flocks from 4.6 ct. for the smaller flocks to 6.7 ct. for the larger flocks. There was little difference for the light breeds. Net cost of egg production per dozen eggs increased slightly in the light-breed flocks as total number of eggs increased but declined slightly for the heavy breeds. Return per hour of labor per dozen eggs increased from 22.4 ct. on farms with less than 150 eggs per layer to 73.5 ct. for those producing over 189 eggs per layer. Labor returns increased as the percentage of lay in October to December, inclusive, increased, as percentage of large eggs increased, and decreased with increase in mortality rate.

Factors that affect incomes on commercial poultry farms, 1940–41, L. B. Darrah ([*New York*] *Cornell Sta. Bul. 803* (*1943*), *pp. 40, illus. 7*).—This is the third bulletin in the study above. The size of business, tenure, use of land, capital, expenses, returns, and labor income of farms are discussed. Analysis is made of

the effects on labor income of size of business, rates of production, labor efficiency, capital turn-over, type and diversity of business, and other factors.

Increases in labor income resulted from increases in size of business, rate of production, and labor efficiency as follows: 100 layers, $88; 1,000 doz. eggs, $68; 100 work units, $225; 12 eggs per layer, $157; and 10 work units per man, $69. It was also found that the value of all labor should represent less than one-third of the total receipts and that gross receipts should equal capital invested in 2 yr. or less. Total work units per farm, egg production per layer, and work units per man were the most important factors affecting labor income. Farms with all three, average or better, made a labor income of $2,552; those with none average or better, —$15.

Economics of the production and marketing of chili in New Mexico, P. W. Cockerill (*New Mexico Sta. Bul. 314 (1944) pp. 18, illus. 6*).—The production areas in the State, cultural and marketing methods, labor requirements and seasonal distribution, costs of production, market preparation, demand, and future production in the State are discussed. A tentative set of standards for sun-dried red chili is outlined.

The field seed industry in the United States, F. V. Beck (*Madison: Univ. Wis. Press, 1944, pp. 230+, illus. 49*).—Analysis is made of yields, production, consumption, and prices of leguminous and grass seeds. The development of the grass seed industry in the United States; the economics of production, distribution, and consumption of seed crops; the seasonal and geographic patterns of seed sales; prices, their trends, relation to other farm prices, and the factors affecting them; and the commercial movement of seed crops are discussed. The appendix includes tables showing for different kinds of grass and legume seed the acreages and production by States, wholesale prices and price relatives 1909–39, farm prices 1910–39, exports 1885–1940, and imports 1907–40.

Local government in southwestern North Dakota: A study of rural local government organization and cost in relation to problems of land utilization, settlement, and tenure, P. L. Hansen, A. B. Goodman, and M. H. Taylor. (Coop. U. S. D. A.). (*North Dakota Sta., 1943, pp. 95+, illus. 9*).—The area, the changes in settlement pattern, and some of the problems of the area are described. The origin and development of county, township, and school-district organization; the administration of taxes; the operation of the finances and indebtedness problems of the local units; and the possibilities for adjustments and reorganization of the different units are discussed and recommendations made.

A study of farming by tenure of farms in Terrell County, Georgia, W. T. Fullilove, J. C. Elrod, and W. E. Hendrix (*Georgia Sta. Bul. 234 (1944), pp. 36, illus. 2*).—The study deals chiefly with the 1936 operations of 97 owners, 27 part owners, and 104 tenants. The farms of 50 owners, 14 part owners, and 24 tenants were operated by croppers. Analyses are made by tenure groups and by farms within the groups as to whether operated with or without croppers of value of farm property, land area in farm and cropped, crop production, conservation practices used, livestock enterprises, receipts, expenses, and income.

Type of farming varied but little among the tenure groups. Size of farm, value of property, and crop yields averaged higher for owners than tenant farms and were higher on the farms operated by croppers than those not so operated. Tenants compared favorably with owners in the extent of soil depletion pracitces but unfavorably as regards soil conservation practices. Income of croppers averaged less than that of owners and tenants but was higher than that for operators on farms with an investment of less than $2,500.

Business of operators now owners compared with that of tenants does not justify the belief that a change from tenants to owners would result in marked improvement in their farm incomes.

Improving farm tenure in the Midwest: Problems and recommended policies. (Coop. 12 expt. stas. and U. S. D. A.). (*Illinois Sta. Bul. 502 (1944) pp. 143–169+, illus. 6*).—This report of the Regional Land-Tenure Research Committee appointed by the directors of the State agricultural experiment stations of the 13 North Central States (North Central Regional Publication No. 2) discusses the problems of farm ownership, continuity of operation of the home farm, inflation of land prices, farm-mortgage terms, landlord-tenant relations, soil conservation, rents and wages, efficient production, inadequate farms, rural-urban communities, and back-to-the-land movements and makes recommendations as to methods of solving or alleviating the problems.

Recent trends in land tenure in Texas, J. R. Motheral (*Texas Sta. Bul. 641 (1944), pp. 48, illus. 9*).—The purpose of this report is to provide factual data for interpreting the changes in land tenure and the factors affecting them. The data are presented largely in tabular and graphic form with a minimum of interpretation and apply chiefly to the period prior to 1940. The several sections discuss the significance and problems of land tenure; trends in distribution of types of operators; population; price relationships; and mechanization; the tenure situation in 1940; the changes in size and value of farms in the tenure groups; effects of age and mobility of operators; effects of the tenure on community institutions; rental agreements, rental rates, etc. A final section deals with the impact of World War II on land tenure and discusses the rates and types of tenancy, farm-to-town migration, farm wage and rental rates, size of farms and mechanization, farm and industrial prices, and land values and farm credit. Rental forms are appended.

About that farm you're going to buy (*U. S. Dept., Agr., Farm Credit Admin., Cir. E–29 (1944), pp. 12, illus. 7*).—A popular circular giving information to prospective land purchasers.

1944 farm labor problems: Farm manpower situation in North Carolina, S. C. Mayo, R. E. L. Greene, C. H. Hamilton, and G. W. Forster (*North Carolina Sta. Bul. 344 (1944), pp. 24, illus. 8*).—Included and discussed are tables and charts showing for the State and the four regions: The number of farms, war units per farm, acreage of cropland, manpower-days of labor needed and available per farm in 1944; percentage distribution of farms having a labor shortage and the amount of the deficit; workers and manpower-equivalent of workers over 10 yr. of age by sex and age; labor needed and available for major types of farming; etc. In most of the tables the farms are grouped on the basis of war units. Lines of action on farm, neighborhood or community, county or regional, State and National levels are discussed.

For the State as a whole the available labor was 10 percent short of that of the supply needed. On an average, farms with less than 16 war units had sufficient manpower in their regular labor force to meet production needs, but those with 64 or more war units need 128 percent of the available labor. Three of every five farms had a labor shortage. The shortage for the State was approximately 37,400 man-equivalent workers. The number of farm people in the armed forces was approximately 75,000.

Making the most use of farm labor, S. C. Mayo (*Res. and Farming [Colo. Sta.], 2 (1944), No. 1, pp. 8, 10*).—This is an analysis of the adjustments made by farmers to curtailed labor supplies and changing labor conditions designed to indicate ways and means of further reorganization.

Less manpower—more production, C. H. Hamilton (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 2, pp. 11–12*).—This is a discussion of the labor supply in relation to farm production during the war.

The war-time machinery situation on farms in Maryland, A. M. Ahalt, W. P. Walker, S. H. DeVault, and P. R. Poffenberger (*Maryland Sta. Bul. A31 (1944), pp. 137–168+, illus. 11*).—This study was made to "(1) determine the

number, condition, and distribution of important machines and equipment on farms in Maryland; (2) supply basic data needed to aid in determining the amount of farm machinery to be manufactured during the war; (3) serve as a guide in rationing new machinery; (4) give suggestions to farmers on labor-saving and time-saving methods of using machinery; and (5) aid in an educational program for the care and repair of farm machinery." The data were obtained from 1,518 records secured through questionnaires distributed to high school students living on farms and 1,543 records obtained from farm production credit loan applications. Additional information was obtained from the United States State War Board for use in adjusting the figures to July 1, 1943; from county agricultural agents and vocational agricultural teachers as to practical new implements, devices, and practices used by farmers; and from the State Department of Education relative to the educational program conducted by it on repair, operation, and construction of farm machinery. In the analyses, the farms are divided according to the six major types of farming areas and four sizes of farm groups. The number of different kinds of machines and the condition and age of the machinery, the trend of tractor and horse population, machinery repair, and the newer labor saving machinery and practices are described and discussed. Charts show the age and condition of the several kinds of machines. The obtaining of greater use of present machinery and extra machinery is discussed.

In the fall of 1942, 16 percent of the total machines were in excellent condition, 36 percent in good, 33 percent in fair, and 15 percent in poor condition. During the year ended June 30, 1943, there were 105 repair centers in 22 counties giving courses. A total of 7,305 farmers were enrolled and 5,764 farm implements were repaired.

Work performed and feed utilized by horses and mules, A. P. Brodell and R. D. Jennings (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, F. M. 44, pp. 26+, illus. 8*).—Tables and maps are included and discussed showing the changes in the number of horses and mules on farms, 1910–44; farms reporting different classes of power; age distribution, average annual use; average weight; and the quantities and kinds of concentrates and roughage fed and the days fed horses and mules; etc.

A study of the farmers' transportation and storage of potatoes in Maine under wartime conditions, C. H. Merchant (*Maine Sta. Misc. Pub. 572 (1943), pp. 26+, illus. 1*).—Data were obtained from 323 growers in the principal potato areas for the 1942 crop season from schedules distributed through high school students. The crops grown, livestock kept, and equipment on the farms are discussed. The storage methods used, distances potatoes are hauled to storage and from farm storage to railroad sidings, the use of trucks, trucks and tire mileages, type of tires, fuel consumption by trucks, operation of tractors by potato growers, and other equipment used are discussed.

Over 50 percent of the production was placed in farm storage, with 43.5 percent in track storage facilities, 2 percent in other storage not at railroad sidings, and 4 percent shipped during the harvest period. On the basis of the study, it is estimated that in all the potato-producing areas for the State 50 percent of the trucks may need some minor repairs in 1943, 45 percent some major repairs and replacements, 5 percent major repairs and replacements, and that 10 percent will need to be replaced annually. It is also estimated that 9,000 tires will be needed annually to maintain an average mileage of 7,000 miles. About 72 percent of the farms included had tractors, of which 56 percent were in good or excellent condition and 11 percent were in poor or very poor condition. Forty-eight percent of the tires were in good or excellent condition and 20 percent in poor or very poor condition. It is estimated that in 1943 front-wheel tires will be needed for about 810 and rear-wheel tires for about 620 tractors.

Livestock-marketing agencies in West Virginia, M. R. Abrahamsen (*West Virginia Sta. Bul. 312 (1943), pp. 81, illus. 26*).—"This study was undertaken to

obtain information as to the operating set-up and business practices of local slaughterhouse operators, local dealers, cooperative marketing associations, and auctions. It aimed to describe the nature and extent of business activity, to determine methods of operation, and to obtain information looking toward improvements in certain operating practices." The data were obtained by personal interviews in the summer of 1940. All slaughterhouse operators, 46 local livestock dealers, all cooperative marketing associations, and all auction markets operating were included, as well as 626 farmers. The several types of markets and their operations, practices, regulations, etc., are discussed in detail and recommendations made on the basis of the data and recent changes in methods of buying, transporting, and selling livestock.

New facts on egg marketing, H. A. WHITE (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 2, p. 9, illus. 1*).—A study of prices charged by six wholesale dealers in 1943 in one of the five leading egg markets in the State showed the following relations between percentages of B and C grade eggs, percentage of small eggs, and the price per dozen charged: Dealer No. 1, 75 percent, over 30 percent, and 36 ct.; No. 2, approximately 84, 7, and 43; No. 3, approximately 74, 13, and 48; No. 4, 98, 18, and 50; No. 5, 89, 24, and 51; and No. 6, approximately 74, approximately 10, and approximately 53.

Post-war possibilities of air transportation of fresh strawberries and tomatoes (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, MTS–19, pp. 1, 4–10, illus. 1*).—This joint contribution of the Bureau and Wayne University, Detroit, Mich., discusses the estimated costs and some of the other advantages of transporting fresh strawberries and tomatoes from Florida to Detroit by airplane.

The comparative estimated costs by air, truck, rail, and rail express (for strawberries) were: For retail quart box of strawberries: 11.3, 4.9, 4.7, and 5.3 ct., respectively, and for retail pound box of tomatoes by air, truck, and rail: 8, 2.1, and 2.1 ct., respectively. "Present information indicates that a very substantial portion of the strawberries now sold during the winter and spring months may move by air to Detroit. It also indicated that almost all or even substantially more than the tomatoes now moving may be carried by air. If one-half of the strawberries and all of the tomatoes now moving over 1,000 miles were moved by air it would mean 2,537 DC–3 plane loads, or during the 6-mo. period an average of 14 DC–3 plane loads per day."

Air transport of perishable foods, R. W. HOECKER (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation, 28 (1944), No. 5, pp. 14–17*).—Covers the same study noted above.

A preliminary report on consumers' problems of every-other-day delivery of milk in Portland and Westbrook, Maine, G. F. DOW (*Maine Sta. Misc. Pub. 571 (1943), pp. 11+*).—The data were obtained in the study previously noted (E. S. R., 91, p. 352). The development of the alternate-day delivery practice, the savings to dealers, the consumers' problems of quality of milk and cream, refrigeration, etc., are discussed.

In general, alternate-day delivery on retail routes is deemed to be satisfactory to consumers. The keeping quality of the milk has not been seriously affected, and most consumers have suffered no serious inconveniences.

Relation of total income on farms to price index, F. B. HEADLEY and M. L. HARTLEY (*Farm Mangt. Bul. [Nevada Sta.], 5 (1944), No. 1, pp. 7+, illus. 3*).—The following relations were found for the period, 1929–43, between (A) gross farm income of four cooperating Nevada farmers and (B) gross Nevada farm income (Bureau of Agricultural Economics estimate) and (C) indexes of agricultural commodity prices in Nevada; and between (D) gross farm income in the United States (B. A. E. estimate) and (E) indexes of agricultural commodity prices for

the United States: (A) = 1.02 (C) —29.4, (B) = 1.07 (C) —27.7, and (D) = 1.29 (E) —34.5.

Farm production, farm disposition, and value of cotton and cottonseed and related data, 1928–42, H. L. Rasor and E. S. Minor (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1944, June, pp. 41+, illus. 1*).—Tables show by States the acreage, yield, production, and value of cotton lint; the production, utilization, and value of cottonseed; the cotton reduction from full yield per acre from stated causes; commercial fertilizers used on cotton; and the percentage of total cotton lint sales made by farmers by months.

Farm production, farm disposition, and value of oats, 1909–41 (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1944, July, pp. 51+, illus. 1*).—Tables show by States by years the production, farm disposition, season average price per bushel, and value of production and of sales.

Sweetpotato storage, 1943, M. C. Gay (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 71 (1944) pp. 9*).—The program of the War Food Administration for price support for sweetpotatoes is described. Tables show by States the sweetpotato farm and commercial storage available at the close of 1942; the new storage (farm and commercial—new construction and converted) for 1943; and the production and farm disposition of the 1943 crop.

[Statistics of feed sales in Ohio and index numbers of production, prices, and income], J. I. Falconer (*Ohio Sta. Bimo. Bul. 229 (1944), pp. 228, 229*).—An extension of earlier data (E. S. R., 91, p. 604).

RURAL SOCIOLOGY

Virginia's rural manpower: A study of population pressure and potential sources of labor supply, A. D. Edwards (*Virginia Sta. Tech. Bul. 92 (1943), pp. 63, illus. 32*).—The population-resources balance of Virginia counties was considered from the angle of underlying economic conditions, population trends, and prevailing standards of living, first for the farm population alone and then for the total rural population. Regional comparisons were also made.

"The various indices used . . . show beyond doubt that many parts of Virginia are suffering from a poor population-resource balance. . . . It should be . . . kept in mind that population pressure is a relative term and that a section may be greatly overpopulated under given conditions and later under a different set of conditions, when its potential resources are used to better advantage, the same section may sustain a much larger population in greater comfort. The high population pressure areas are characterized by much . . . poor land, high birth rates, lack of employment opportunities, low incomes, inefficient utilization of labor, relatively small capital investment per worker, low educational levels, a lack of modern home conveniences and facilities, and inadequate institutions. The reverse of these conditions tends to predominate in areas of low population pressure. In the latter both agriculture and industry tend to be expanding."

The one-eighth of the farms with produce valued at above $1,500 produced around 60 percent of the total value of the State's farm products in 1939. The three-fifths of the State's farm operators with gross farm incomes of under $600 in 1939 produced 20 percent of the value of the State's farm products, and 10 percent of the value of such products entering the market. Such industrial development as is found in areas of high population pressure tends to be relatively unstable. Mining and sawmilling, the two most common nonagricultural industries in such areas, tend to boom during prosperous years and to decline during depressions. Fishing, important in the coastal counties, is an industry subject to economic as well as biological fluctuations. The industries which exist in the Shenandoah Valley and northern Virginia are relatively stable and wages are reasonably high.

The 126 man-work days per farm worker estimated to have been spent on an average in crop production and care of livestock indicate a fairly widespread failure to maintain a proper combination of land, labor, capital, and operating efficiency. Between 1930 and 1940 there was some increase in population in both types of areas, but in the areas with more meager resources population increases occurred because of the high birth rate and the lack of opportunities elsewhere rather than because of increased labor needs. The areas of high population pressure are usually less able to provide employment for their youth than the areas of better resources. The migration from areas of relatively meager resources is undoubtedly more wholesome than a further piling up of population, but it should be recognized that it involves a considerable drain upon these areas. The areas with the most meager resources are forced to provide education and training, not only for persons who spend their productive years there, but also for a large number of migrants to other areas. The relatively low birth in the more prosperous areas and their higher level of productive employment have made it easier for such areas to provide training for their youth.

Use of the survival rate method in measuring net migration, C. H. HAMILTON and F. M. HENDERSON. (N. C. Expt. Sta. et al.). (*Jour. Amer. Statis. Assoc., 39 (1944), No. 226, pp. 197–206, illus. 2*).—The authors demonstrate that in measuring net migration during recent intercensal periods survival rates derived from the age distributions of the Federal census are superior to survival rates derived from life tables. Survival rates based on State and national life tables may be used in adjusting Federal census survival rates for use on a State basis. Two reliable methods are suggested for deriving survival rates for use in measuring net migration on a county basis, the method of measuring the rate of net migration and calculating the amount of migration among people who die during an intercensal period, and a method for measuring the relation between net migration and population pressure.

Wages and housing facilities for farm labor, W. P. WALKER and S. H. DEVAULT (*Maryland Sta. Bul. A29 (1943), pp. 67–92+, illus. 1*).—Data for 1942 were obtained from 252 farmers in the five major types of farming areas of Maryland as to the number of laborers of different types employed, cash wages, perquisites, and housing facilities supplied them, and analyses are made for each type of laborer —permanent, seasonal, and piece work. The physical features of farmhouses, farm labor camps in the State, and miscellaneous farm labor problems are discussed.

The group of farmers hired 342 permanent and 203 seasonal laborers. Of the permanent laborers 46 percent were hired by the month. Ten percent of the permanent laborers were under age, about half being 15 to 16 yr. old. Perquisites were furnished 96 percent of the laborers hired by the month and 98 percent of the permanent day laborers. The average cash wages and value of perquisites were: Monthly labor, $43 and $20; weekly labor, $11 and $4; and day laborers, $1.81 and 56 ct. Perquisites were furnished to 89 percent of the seasonal day laborers and 36 percent of the laborers employed by the hour. The average wage of day laborers was $2.74 and the value of perquisites 44 ct. Piece-work laborers earned $3.86 per day. One-half of the permanent and seasonal laborers were housed in tenant houses on the farms, and one-fourth in the farmers' dwellings. The farmers' dwellings averaged 8.6 rooms and housed 4.3 persons. The tenants' houses averaged 5 rooms and housed 4.8 persons. Of the farmers' dwellings over 50 percent were in good and 6 percent in poor condition. Twenty-eight percent were equipped with central heating plants. Over 50 percent had running water and 44 percent bathrooms. Of the tenant houses 23 percent were in good and 19 percent in poor condition. Nearly all were heated with coal or wood stoves. Sixteen percent had running water and 8 percent bathrooms. Eighteen camps for seasonal laborers were operated in 1943. Eight, with a capacity of 2,600 workers, were occupied by migratory workers and 10 largely by boys, girls, and women from Maryland and the District of Columbia.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

American farming: Agriculture II–IV, A. Boss, H. K. Wilson, and W. E. Petersen (*St. Paul, Minn.: Webb Book Pub. Co., 1940, vol. 2, pp. 509+, illus. 202; 1941, vol. 3, pp. 494+, illus. 136; 1944, vol. 4, pp. 367+, illus. 103*).—This is the continuation of the series previously noted, which is planned for secondary school students (E. S. R., 81, p. 732). Volume 2 is presented from a vocational viewpoint. It deals with such subjects as elements of farm business, accounting, the inventory, mapping the farm and farm production, checking results, improving the farm organization, different crops, and the improvement of livestock enterprises. Volume 3 deals with farm operation and is prepared from a vocational viewpoint. The chapters cover farm operation compared with farm organization, determining results and measuring efficiency of operation, making adjustments, shaping the work program, equipment, marketing problems, producing home and farm supplies, the principles involved in crop production operations, the place of livestock in farm operation, production of different crops, and the management of different kinds of livestock. Volume 4 "directs the student to a functional understanding of the interrelationships of the more technical and complex problems of the science and art, the business and social aspects, and the economic principles of successful modern farming activities." It includes chapters on: Do I want to farm; becoming established in farming; legal matters; use of capital and credit; marketing products; planned production programs; principles of genetics; improvement of grains, corn, grasses, legumes, fruits, and potatoes; and systems of animal breeding; and breeding of livestock and poultry. Volumes 2 and 3 include bibliographies, and volumes 2, 3, and 4 include suggestive questions, activities, and problems following most of the chapters.

Practical farming for the South, B. F. Bullock (*Chapel Hill: Univ. N. C. Press, 1944, pp. 510+, illus. 210*).—"This book is an effort to give practical help to teachers in teaching young people some basic things they need to know if they are to be successful in living in the country and by the pursuit of agriculture." Chapters 1–9 deal with plant production—soils; fertilizers; plant growth, reproduction, propagation, and improvement; the home garden and orchard; field crops; the wood lot; and the rural home. Chapters 10–15 deal with animal production—feeding and care; improvement; and milk, pork, poultry, and honey production. Chapters 16–18 deal with farm financing and literature—farmers' cooperatives and farm publications.

George Washington Carver, B. Miller (*Grand Rapids, Mich.: Zondervan Pub. House, 1944, 3. ed., pp. 166*).—The data for this sympathetic account, which devotes considerable space to research undertakings, are stated to have been gathered from the Tuskegee Institute files.

Directing vocational agriculture day-school students in developing their farming programs, W. A. Ross, D. M. Clements, and E. J. Johnson (*Fed. Security Agency, U. S. Off. Ed. Vocat. Div. Bul. 225 (1944) pp. 72+, illus. 27*).—Procedures are set forth for guiding students in planning and developing long-time supervised farming programs leading to establishment in farming. The bulletin is primarily for instructors of vocational agriculture, teacher trainers, and supervisors, and is designed to assist in guiding day-school students in planning and developing individual farm programs. The seven sections deal with relationship between planning and developing individual farming programs and instruction offered in vocational agriculture, components of an individual student's supervised farming program, examples of individual farming programs developed by day-school students of vocational agriculture, developing cooperative relationships in connection with the student's supervised farming program, assisting the student in launching his individual farming program, assisting the student to develop further and improve his supervised farming program, and supervising and evaluating the students' farming programs.

Public school organization and support, W. F. Kumlien (*South Dakota Sta. Rpt. 1943, pp. 49–50*).—The author found far too many small and uneconomic

public school units in the State. Since 1920, some 21.5 percent of the common rural schools have been closed. Another 9.5 percent have less than 5 pupils enrolled per school. About 42 percent of the high schools have an enrollment of fewer than 50 pupils, and 72 percent have fewer than 100 pupils per school. This makes instructional cost per pupil unduly high and uneconomic.

FOODS—HUMAN NUTRITION

Principles of nutrition and nutritive value of food, H. C. SHERMAN (*U. S. Dept. Agr., Misc. Pub. 546 (1944), pp. 40, illus. 1*).—In the foreword by E. C. Auchter, it is noted that this publication marks the one-hundredth anniversary of the birth of W. O. Atwater, first Chief of the Office of Experiment Stations of the Department, and the fiftieth anniversary of the first recognition by Congress of human nutrition as a matter of public concern by the appropriation of funds for work in this field under his direction. As a tribute to him, the publication has been given the same title as Farmers' Bulletin 142 (E. S. R., 13, p. 974), prepared by Atwater in 1901.

Of particular interest are the two final sections of the publication entitled What Our Food Habits Mean and Could Mean and The Nutritional Improvement of Life. In the first of these, data are tabulated and discussed on the nutritive value of civilian per capita food supply, 1935–39 and 1943, in comparison with the National Research Council recommended dietary allowances for 17 age sex-activity groups, weighted by the estimated number of persons in each group in 1943. This table indicates that the national food supply furnishes amounts of calories and protein "sufficiently above our demonstrable needs to approximate the optimum or possibly more"; of calcium "but very little margin above the strict minimum requirements of the recent scientific evidence"; and of iron, thiamine, and niacin, because of the general introduction of enriched flour and bread, "ample margins for safety." Concerning vitamins A and C, it is pointed out that although in the average American food supply "each meets the recommendations of the National Research Council with a fair margin to spare, . . . yet there is sufficient objective evidence to call for greater care on our part to obtain dietaries of high vitamin A and C values for all our people." Riboflavin is thought to be, "of all the nutrients of which our knowledge is sufficiently accurate and quantitative to permit this kind of comparison, the one least adequately furnished by the average American food supply." In the final section the author gives a few examples from "a large and growing mass of evidence that, even when the starting point is a dietary apparently adequate and a bodily condition already healthy and efficient, we can build to higher levels of health and efficiency by using the guidance of the new knowledge of nutrition in our habitual choice and use of everyday food," and predicts that, "as the new knowledge of nutrition is more generally understood and followed, a greatly increased proportion of people will build their own and their children's lives to those higher levels of health and enjoyment and social usefulness which have hitherto been the privilege of only the most fortunate few."

The art and science of nutrition: A textbook on the theory and application of nutrition, E. E. HAWLEY and G. CARDEN (*St. Louis: C. V. Mosby Co., 1944, 2. ed., pp. 668, illus. 139*).—This book, now in the second edition, considers first the principles of normal nutrition and then discusses (1) nutritional requirements under special conditions and (2) diet therapy as special adjustments of the normal nutrition pattern. Under normal nutrition, consideration is given to digestion, metabolism, the blood and lymph, and endocrines with regard to their function in or relation to normal body nutrition; food needs, discussed with respect to protein, fat, carbohydrate, vitamin, and mineral requirements, functions, and food sources; water balance; and diet roughage. Based on these considerations, the essentials of an adequate diet are outlined, practical general considerations for meal planning are

offered, and the problems of weight control and of evaluating nutritional status are discussed. Under the heading of special conditions, attention is given to food requirements in normal pregnancy and lactation and in the development and feeding of infants, children, and the aged. The diet therapy section presents general suggestions for diet therapy and the feeding of invalids, followed by comments on the nutritional problems in specific conditions of disease (such as diabetes, celiac disease, and the anemias, to mention but a few of the ones considered), with general recommendations for the dietary management of these conditions. Part 4 of the book, set up in outline form for teaching purposes, deals with the choice, preparation and serving of foods. Part 5 contains an extensive bibliography classified as to subject matter, and part 6 is the appendix of food tables and food classifications.

The effect of certain dietary ingredients on the keeping quality of body fat, R. H. Barnes, W. O. Lundberg, H. T. Hanson, and G. O. Burr. (Univ. Minn.). (*Jour. Biol. Chem., 149 (1943), No. 2, pp. 313–322, illus. 9*).—Lettuce, avenex, rice bran, yeast, hydroquinone, mixed tocopherols, and wheat germ oil as antioxidants, given in dietary supplements to rats that had been raised to the age of 150 days on a diet producing body fat of normal stability, had no effect on increasing the stability of this normal fat. The fat tested was that removed from the abdomen and then subjected to deaeration (after freezing) and filtration (at 60° C.) through diatomaceous earth. The keeping time of the fat was judged by peroxide accumulation in samples kept in small vials at 63° or by oxygen absorption in very small samples kept at 100° in a Warburg apparatus. High protein diets (30 percent, from casein and yeast) from weaning to the age of 150 days did not affect the amount of fat deposited, as compared with the effect of a low (15 percent) protein diet, nor influence the keeping time of the body fat. The keeping time of the rat body fat was markedly reduced by continued ingestion of a diet free of vitamin E and other sources of fat-soluble antioxidants, suggesting that in the rat antioxidants of the body fat are derived solely from the diet. Ingestion of certain antioxidants such as yeast and hydroquinone did not restore normal stability to body fat in vitamin E-deficient rats, but α-tocopherol did effect such a restoration. The body fat of rats fed rancid lard contained no prooxidants, although the stability of such body fat was reduced. This reduction in stability is ascribed to destruction of the dietary antioxidants by the rancid fat. Naturally occurring antioxidants in the fat depots appeared to be stable for relatively long periods and not to require frequent replenishment from the diet.

Effect of extremely low rates of heat penetration on tendering of beef, S. Cover. (Tex. Expt. Sta.). (*Food Res., 8 (1943), No. 5, pp. 388–394*).—Paired standing-rib and arm-bone chuck roasts were cooked well done, and bottom-round roasts both rare and well done, at oven temperatures of 125° and 80° C. The meats cooked at these temperatures were well done, with characteristic uniform gray color when cut, when the internal temperatures of the roasts were 80° and 70°, respectively; and rare, with characteristic pink color when cut, when the internal temperatures were 63° and 58° or 59°, respectively. The roasts were tested for tenderness by the paired-eating method described by the author (E. S. R., 84, p. 550), by a five-point scale of weighted adjectives, and by the Warner-Bratzler shearing device. The cooking data and tenderness values are tabulated, and the results summarized as follows:

"Roasts which were always tender were obtained when the rate of heat penetration was slow enough so that it required 30 hr. or more for them to lose their pink color. With less time the roasts were not always tender. Well-done roasts from the 80° oven were not plump although their internal temperatures had reached 70° C. (158° F.), high enough for the heat to have contracted the collagen which they contained. This is taken as evidence that in these roasts the conversion of collagen had progressed beyond the point where contraction could take place. The large

amount of connective tissue in well-done bottom-round roasts cooked at 80° appeared to be completely changed from its hard and tough state to a moist, viscous mass which, while warm, was without resistance to either the knife or the teeth. Since the moisture loss from these roasts was quite moderate in amount and the coagulation time was very long, it is suggested that the water of hydration was released slowly enough from the meat proteins so that it was used effectively for converting collagen into gelatin. The muscle fibers in the well-done arm-bone chuck roasts, which required 40 hr. to lose their pink color, were so very tender that the judges described them as 'mealy,' a finding quite different from the usual conception that the muscle fiber during cooking becomes denser and tougher. It appears that there are two structures in meat which contribute to its toughness—muscle fiber and connective tissue. Both may be made 'very tender' by cooking if the cooking is slow enough so that 40 hr. are required for the meat to lose its pink color. The chemical factor causing tendering in connective tissue appears to be the change from collagen into gelatin, but the one causing tendering in muscle fibers was not identified." In spite of the very tender quality of the meats cooked at 80°, their greasy appearance, dark unpleasing color, comparative lack of flavor, dryness to the extent of seeming "mealy" in the mouth, and poor slicing texture discouraged recommendation of this low oven temperature for home use.

Action of hardwood smoke on bacteria in cured meats, L. B. JENSEN (*Food Res., 8 (1943), No. 5, pp. 377–387*).—This paper presents a brief historical review of the practice of smoking meats; notes the desirable effects to be gained by proper smoking of cured meats; points out that "liquid smoke" is not used in commercial meat establishments; discusses the smokehouse and smoke generation, the chemical composition of wood smoke, and the bactericidal action of smoke; and presents the results of some studies, credited to W. M. Urbain, on the smoking of cured bacon. Proper smoking brings out color inside cured pieces, impregnates the outside with constituents of smoke that serve as antiseptics and germicides, thereby reducing surface bacteria to very low numbers, effects some tendering due to the heat and salt, imparts a glossy appearance due to the deposition of resins condensed from the aldehydes and phenols in the smoke, and, in bacon, exerts an antioxidant action on the fat. In good smoking practice, most cured meats should not be held in the temperature zone of 65°–105° F. for more than 8 hr. "The nonsporing psychrophiles which are active during the curing of bacon are largely destroyed along with the nonsporing mesophiles during the smoking process. Thermophiles, if not inhibited by 3.5 percent of sodium chloride in cured sausage items containing extenders, such as large bologna with soya grits, may produce gas and spoil the food. Molds will grow in many smoked meats because of their great resistance to salt and the smoke constituents residual on the meat. There are many strains of obligate, halophilic molds which complicate the preservation of smoked, cured meats."

Rice.—II, Rice grain and its products, C. YAMPOLSKY (*Wallerstein Labs. Commun., 7 (1944), No. 20, pp. 4–26, illus. 14*).—In continuation (see p. 679) this review considers the following phases of the subject: Basic structure of the rice grain; varieties; aleurone layer in relation to manurial treatments; shocking, threshing, and storing rice; milling; milling of parboiled rice; effect of milling on composition of rice; products of the milling process; protein, minerals, and vitamin B complex content of rice; digestibility; glutinous and nonglutinous rices; the alkali test as an indication of culinary quality; and rice as an adjunct in brewing. Twenty-four references are cited, and certain data are quoted. There are included 14 illustrations.

Grain sorghum and its uses, J. H. MARTIN. (U. S. D. A.). (*Wallerstein Labs. Commun., 7 (1944), No. 20, pp. 33–38, illus. 3*).—This review discusses the extent of production and the yield of sorghum, the growing of grain sorghum, varie-

ties, and composition and industrial uses. Work of the U. S. Department of Agriculture is included.

Macaroni cooking value of some North Dakota durum wheat samples, R. H. HARRIS and D. KNOWLES. (N. Dak. Expt. Sta.). (*Food Res., 8 (1943), No. 4, pp. 292–298, illus. 1*).—The cooking quality of a number of varieties of durum wheat produced at Fargo and Langdon in 1939 and 1940 was evaluated by procedures previously developed (E. S. R., 82, p. 697) and involving determination of the increase in volume (or weight) of macaroni made from flours milled from the wheats, degree of disintegration upon cooking, and tenderness of the cooked product.

"Varietal differences in cooked weight and tenderness score were demonstrated by the results obtained. Cooked-weight values were lower than those reported by other workers as well as by the authors in previous work. Yearly variations were also found for four varieties grown consecutively at Fargo for 3 yr. Cooking quality apparently bears no relationship to color, the accepted criterion of macaroni value.

"Correlation coefficients were computed between cooked weight and semolina protein, cooked weight and tenderness score, and semolina protein and tenderness score. These constants were below the level of significance and did not agree with the previous findings by the authors in which significant negative relationships were found between cooked weight and the other two variables, and a positive relationship between semolina protein and tenderness score. This may be explained by yearly differences in properties among the durum varieties as well as by the effects of damage by wheat fungus.

"Wheat blights, including the damage commonly known as 'black point,' were found to reduce significantly the cooked weight and tenderness score, particularly if the damage was severe. The degree of disintegration upon cooking was increased by the presence of infected wheat in the blend, heavily damaged kernels having the most marked effect."

Carbohydrates of the Ebenezer onion, E. BENNETT. (Mass. Expt. Sta.). (*Food Res., 8 (1943), No. 4, pp. 273–274*).—A partial chemical analysis of the Ebenezer onion indicated the presence of the following constituents in amounts expressed as percentage of the moisture-free material: Total ash 4.54; total nitrogen 1.98; total pectic compounds 4.45; total hemicelluloses 1.88; total furfural 1.40; total soluble sugars 64.23; total reducing sugars 11.34; and total nonreducing sugars 52.89. The ratio of reducing to nonreducing sugars was a variable influenced by cultural conditions, length of storage, and condition of storage. Determinations of aldose and ketose forms, of specific rotations before and after inversion, and other tests yielded information indicating that the chief nonreducing sugar was sucrose. This fraction, when hydrolyzed, together with the reducing sugars yielded a mixture, constituting almost 65 percent of the dry matter, nearly all of which could be fermented and which was apparently about two-thirds *d*-fructose.

Some experiments in preparing brewers' yeast for food, J. V. MACDONOUGH and T. C. HAFFENREFFER, JR. (*Wallerstein Labs. Commun., 7 (1944), No. 20, pp. 39–46, illus. 1*).—The potential value of dried brewers' yeast as human food is indicated in the brief review of its composition in terms of proximate constituents and vitamin content. Experimental work and actual plant procedures on the debittering of yeast by weak alkali treatment, essentially as described by Burton as noted on page 767, indicated that in this process pH of the alkaline debittering solution should not be permitted to go below 10.0 during contact with the yeast. Moreover, the debittering and washing operation should be conducted in a minimum of time to minimize vitamin destruction and yeast cell injury. The absorption of riboflavin from the wort during fermentation was observed in tests conducted under brewery conditions, in which 231 gm. of liquid ale yeast was mixed with 112 lb. of 15° Ball. cooled and aerated wort from the brewery and divided into four lots, sampled, respectively, at the end of 24, 48, 72, and 96 hr. to determine the amount of

yeast growth and the riboflavin pick-up by the yeast during fermentation. There was a fourteenfold multiplication of the ale yeast during fermentation in contrast to the tenfold recovery in regular plant fermentation. The yeast absorbed riboflavin only during the growth of new yeast cells, the absorption of the riboflavin appearing to parallel the growth of the yeast, which seemed to synthesize no riboflavin during fermentation. The living yeast produced could be fortified in vitamin content by mixing it with synthetic vitamins or with a liquid prepared from another lot of yeast hydrolyzed by gentle heat treatment to liberate the natural vitamins of that yeast; tests involving the latter method showed that under the conditions employed 86.3 percent of the thiamine and 4.6 percent of the riboflavin from the hydrolyzed yeast were absorbed by the living yeast. The plant process for preparing debittered enriched brewers' yeast as a foodstuff is described.

Vitamin-rich food made from byproduct yeast, L. V. BURTON (*Food Indus., 15 (1943), No. 11, pp. 66–69, 144, illus. 9*).—This is an account of plant scale operations involved in debittering byproduct brewers' yeast, by alkali treatment at pH 11-12 followed immediately by thorough washing, and in subsequent enrichment of the yeast with B vitamins obtained by plasmolysis of other lots of yeast.

Home practices and the nutritive value of fruits and vegetables, J. I. SIMPSON. (Univ. Ill.). (*Food Res., 8 (1943), No. 5, pp. 353–363*).—This review summarizes the results of reported studies bearing on factors influencing the nutritive value of foods as prepared in the home. Consideration is given to such phases as initial differences in the food selected and changes occurring in home storage, in preparation preliminary to cooking, in cooking, and in holding and reheating cooked food.

Home canning of fruits and vegetables (*U. S. Dept. Agr. 1944, AWI–93, pp. 16, illus. 54*).—This publication supersedes AWI–41, Wartime Canning of Fruits and Vegetables, and AWI-61, Canning Tomatoes, and presents up-to-date directions and timetables backed by research for the home canning of fruits and vegetables.

Vegetable preservation handbook for wartime use, J. E. RICHARDSON and H. L. MAYFIELD (*Montana Sta. Cir. 178 (1944), pp. 23*).—This handbook brings up to date and extends the instructions for preservation of vegetables by canning, freezing, etc., given in Circular 174 (E. S. R., 89, p. 501).

Notes on drying fruits and vegetables, N. C. TETER (*Res. and Farming [North Carolina Sta.], 2 (1944), Prog. Rpt. 2, pp. 1, 2, illus. 2*).—In these progress notes, types of electric dehydrators designed and tested at the station are described. One of these with a tray surface of 22 sq. ft. and heating capacity of 2,400 w. proved too large and expensive for average home use but excellent for a laboratory dehydrator because of its temperature control with a mercury contact thermometer and electric relay and its easy regulation of humidity by sliding doors and curved louvers to control air circulation. A small dehydrator (4 sq. ft. of tray area) of practical home value was constructed with a regular chick brooder unit as a heating element. In this, temperatures up to 150° [F.] are possible when the unit is loaded. This dehydrator is illustrated, and certain precautions to be followed in its construction are described. A simple stove-top drier is also illustrated.

Home drying methods and their effect on the palatability, cooking quality, and nutritive value of foods, E. L. BATCHELDER. (U. S. D. A.) (*Amer. Jour. Pub. Health, 33 (1943), No. 8, pp. 941–947*).—This review, presented as an address, is based on preliminary results obtained in cooperative studies. Equipment and methods, palatability tests, observations concerning keeping quality, and a few results concerning mineral and vitamin losses are discussed.

Drying of meats: Rate of dehydration of uncooked cured ground meats, E. C. RITCHELL, E. L. PIRET, and H. O. HALVORSON (*Indus. and Engin. Chem., 35 (1943), No. 11, pp. 1189–1195, illus. 11*).—"An investigation has been made of the air drying under various conditions of samples of uncooked cured meat to form products having properties similar to dry, or summer, sausage. The rate of drying

is materially affected by the handling operations and temperature conditions, which may cause the fat to film over the material. As contrasted to the usual dry sausage manufacturing operations, shorter times of drying are necessary to obtain a product containing 25–30 percent moisture. This is particularly true when the material is dried in the form of small cylinders. The products obtained are similar in color and palatability to the usual dry sausage sold on the market. The small particles, however, do not adhere to form a solid hard mass. If larger samples—for example, 4 × 1⅛ in. in cross section—are dried, solid firm products are formed in about 15 days. Such observations as could be made over the period of a year indicate that the keeping qualities and bactericidal properties of the dried products are decidedly favorable."

Dehydration procedures and their effect on vitamin retention, R. S. Hollingshead. (U. S. D. A.) (*Amer. Jour. Pub. Health, 33 (1943), No. 8, pp. 969–974*).—This review, presented as an address, is concerned in general with the various steps involved in the preparation of dehydrated products, the types of dehydrators, and the problem of adequate packaging. It is pointed out that properly conducted steam blanching results in better vitamin retention (ascorbic acid in particular) than hot-water blanching; that vitamin losses in storage may be greater than losses incurred in preparation and dehydration of the product; that part of the vitamin losses in storage are due to oxygen and part to moisture; and that this latter effect can be decreased by reduction of the moisture content of the dehydrated product below 4–6 percent levels.

Losses of vitamins which may occur during the storage of dehydrated vegetables, D. K. Tressler, J. C. Moyer, and K. A. Wheeler. (N. Y. State Expt. Sta.). (*Amer. Jour. Pub. Health, 33 (1943), No. 8, pp. 975–979, illus. 2*).—The carotene, thiamine, and ascorbic acid contents of rutabagas, beets, cabbage, and potatoes were followed during commercial dehydration and subsequent storage under controlled conditions. The rutabagas and potatoes were diced and shredded, respectively, and blanched prior to dehydration, and the beets were cooked and diced, but the cabbage was shredded and dehydrated directly without blanching. Moisture contents of the dried vegetables ranged from 5.5 to 8.4 percent. Prior to storage, the dehydrated vegetables were packaged (1) in glass containers, (2) under carbon dioxide in glass containers, and (3) in either moisture-proof cellophane or pliofilm bags. Storage temperatures employed were —40°, 33°, 58°, and 75° F. In the processes prior to dehydration only about 2 percent of the carotene in rutabagas was lost; only 16–17 percent of the thiamine in beets and rutabagas, but almost one-third of it in potatoes, was dissolved out in the blanching; ascorbic acid losses at this stage amounted to 16 and 22 percent, respectively, for beets and rutabagas, but to 60 percent for potatoes. Dehydration caused little or no additional loss of thiamine, but ascorbic acid losses were increased to 31, 85, and 100 percent in the beets, rutabagas, and potatoes, respectively. The unblanched cabbage lost but little thiamine in dehydration and only about 20 percent of its ascorbic acid. "Regardless of the type of container or storage condition, none of the samples lost an appreciable amount of thiamine during the test periods of 3 or 4 mo. No one of the samples stored at —40° lost much carotene. At higher temperatures the loss was much more rapid. Storage under carbon dioxide reduced the loss of this vitamin; the advantages of storage under carbon dioxide were particularly noticeable at the highest temperature (75°). No one of the samples of rutabagas or cabbage lost much ascorbic acid during storage at —40° for 3 mo. At higher temperatures, there was a considerable loss from all of the samples of these vegetables."

Losses of vitamins which may occur during the cooking of dehydrated vegetables, F. Fenton, B. Barnes, J. C. Moyer, K. A. Wheeler, and D. K. Tressler. (Cornell Univ. and N. Y. State Expt. Sta.). (*Amer. Jour. Pub. Health, 33 (1943), No. 7, pp. 799–806*).—In continuance of the above study, losses of thiamine, ascorbic

acid (cabbage only), and carotene (rutabagas only) were followed in the cooking of the dehydrated vegetables under different conditions. On the dry matter basis the uncooked commercially dehydrated beets contained 1.7 μg. of the thiamine per gram, the potatoes 4.3 μg., and the cabbage and rutabagas 5.3 μg. When the vegetables were cooked in family quantity (50 gm. = 4–5 servings), neither the initial temperature of the cooking water from 20° to 98° C. nor cooking with or without refreshing for 30 min. (also 60 min. in the case of cabbage) made any difference in the percentage of thiamine retained in the vegetable, dissolved in the cooking water, or destroyed. An increase in the amount of cooking water from the minimum for each vegetable caused a very marked and consistent decrease in the amount of thiamine retained in each vegetable and an increase in the amount dissolved in the cooking water; there was no destruction of the thiamine, however, with increase in the amount of cooking water.

The unblanched dehydrated cabbage contained about 4 gm. of ascorbic acid per gram on the dry-matter basis. Increasing the initial temperature of the cooking water from 20° to 98° increased the retention of the ascorbic acid in the cabbage and decreased the destruction of the vitamin. Refreshing the cabbage before cooking resulted in decreased retention of ascorbic acid, a decrease in the amount of the vitamin in solution, and an increase in the amount of the vitamin destroyed. Increasing the amount of the cooking water had no effect on the amount of ascorbic acid destroyed, but it increased the amount that dissolved in the cooking water and decreased the amount retained by the cabbage. Increasing the amount of cooking water likewise caused a decreased retention of carotene in the case of the rutabagas. "When steamed in quantity, commercially dehydrated beets, cabbage, potatoes, and rutabagas retained 82 percent of their thiamine, 88 percent, 87 percent, and 74 percent, respectively. The remainder of the thiamine was found in the small amount of cooking water present. At the end of the 'holding' period this water was absorbed by the vegetables. When steamed in quantity, commercially dehydrated beets, cabbage, potatoes, and rutabagas contained 0.34 μg. of thiamine per gram, 0.64 μg., 0.79 μg., and 0.68 μg., respectively. For beets and cabbage the amount is about the same as when they were placed in a small amount of boiling water and cooked without refreshing. The steamed vegetables lost no appreciable amount of thiamine upon being held in a warming oven for 1 hr. Practically all of the cooking water was absorbed. Steaming was a very satisfactory method for quantity cooking of dehydrated beets and potatoes from the palatability standpoint. It was not satisfactory for the so-called strong juiced vegetables, cabbage and rutabagas."

Palatability studies of commercially dehydrated vegetables.—I, Effect of several methods of storage on palatability of beets, cabbage, and rutabagas. II, Effect of several common refreshing and cooking methods on palatability and water absorption of beets, cabbage, potatoes, rutabagas, and yellow turnips, F. Fenton and H. Gifft. (Cornell Univ. coop. U. S. D. A. et al.). (*Food Res., 8 (1943), No. 5, pp. 364–376*).—These palatability studies supplement the above reports on the effects of dehydration and subsequent cooking on the vitamin values of vegetables. Observations are presented in detail concerning the influence of the various storage conditions and rehydration methods employed on the palatability of the dehydrated vegetables. In general, the effect of the storage conditions on the dehydrated cabbage, beets, and rutabagas was more noticeable in the uncooked than in the cooked vegetable. The cooked dehydrated beets reflected little difference due to storage conditions of the dehydrated samples; cooked unblanched, dehydrated cabbage, however, was not of satisfactory flavor and color if the dehydrated product had been stored at 14° or 24° C, whereas storage at —40° or 0.5° resulted in cooked cabbage of satisfactory quality. Unfavorable storage conditions for dehydrated rutabagas resulted in a faded color of the cooked product, but had little effect on flavor. Storage temperatures brought about more noticeable differences than did

the method of packaging. At 0.5° the type of packaging was not so important as at higher temperatures, and at —40° it was not a noticeable factor. Storage in CO_2 lessened the effects of temperature differences. In the refreshing trials the initial temperature of the water—20°, 80°, and 98°—in which the vegetables were soaked had very little effect on the amount of water reabsorbed or the palatability of the cooked vegetables. Unblanched, dehydrated cabbage started cooking in boiling water retained 71 percent of its ascorbic acid; started in cold water it retained only 43 percent. Variation in the length of the refreshing period had little effect on the amount of water reabsorbed by cabbage and potatoes, whereas beets soaked for half an hour took up more water than those cooked with no soaking. Increase in the soaking period beyond 30 min. resulted in no increase in water absorption. The amount of water absorbed by the rutabagas and turnips increased gradually with increase in the refreshing time. Long soaking resulted in water-soaked vegetables, loss of flavor, and often loss of color. Unblanched, dehydrated cabbage put in cold water and cooked after 0, 30, and 60 min. of soaking retained 28, 19, and 7 percent of its ascorbic acid, respectively.

Preservation of vegetables by salting or brining, J. L. Etchells and I. D. Jones. (Coop. N. C. Expt. Sta.). (*U. S. Dept. Agr., Farmers' Bul. 1932, rev. (1944), pp. 16, illus. 17*).—In the present revision, working instructions are presented in greater detail and with greater emphasis on the necessary precautions than in the earlier edition (E. S. R., 90, p. 125). A section on the making of kraut in glass jars has been added.

Preserving foods by freezing, J. G. Woodroof. (*Georgia Sta. Bul. 233 (1944), pp. 42, illus. 14*).—In this bulletin, superseding Bulletin 212 (E. S. R., 85, p. 693), many of the now well-known details of the earlier publication are omitted; the list of foods that can be successfully frozen is increased by the inclusion of precooked foods such as sweetpotatoes, pumpkin, rutabagas, and tomatoes; more knowledge of steam blanching has resulted in some changes in the tabulated directions for freezing; emphasis is given to the many services that should be included in the operation of a locker plant for the benefit of patrons and additional income to the owner and to the increased economy of locker service possible in the most effective staggering of input and outtake; and a new section on home freezers and a short one on commercial freezing of foods have been added. A table of suggested monthly deposits in the locker lists 14 vegetables, 11 fruits, 4 meats, and 3 other products that might be preserved in an average freezer locker.

Effect of method of thawing upon losses, shear, and press fluid of frozen beefsteaks and pork roasts, G. E. Vail, M. Jeffery, H. Forney, and C. Wiley. (Kans. Expt. Sta.). (*Food Res., 8 (1943), No. 4, pp. 337–342*).—Thirty-three paired beefsteaks and 48 paired pork roasts, chiefly from experimental animals of known history, were studied. The results indicated that thawing beefsteaks and pork roasts at room temperature, at refrigerator temperature, and in the oven gave similar results. However, both steaks and roasts thawed at oven temperature were slightly less tender and required a longer cooking time than those thawed by the other two methods. Steaks and roasts thawed at room temperature yielded the least press fluid and the roasts thawed at room temperature had the highest percentage of total loss. Total cooking losses for the steaks thawed at the several temperatures averaged about 20 or 22 percent and for the roasts, about 32 or 34 percent.

Changes occurring in fruit juices during storage, H. G. Beattie, K. A. Wheeler, and C. S. Pederson. (N. Y. State Expt. Sta.). (*Food Res., 8 (1943), No. 5, pp. 395–404, illus. 2*).—Raspberry and strawberry juices were cold-pressed and currant juice hot-pressed (65° C.), usually from thawed frozen fruit. The expressed juices were immediately deaerated at 6–12 cm. of mercury pressure, pasteurized by heating in a stainless steel kettle, and filled at pasteurizing temperature into heated bottles which were sealed and stored in the dark and in the light at tempera-

tures of 1°, 21°, and 32° for various periods up to 3 mo. Changes in color, ascorbic acid content, and other characters were followed over the storage period. The data presented and discussed, in particular detail for the strawberry juice, showed that the freshly processed juices contained appreciable amounts of ascorbic acid (0.15 and up to 0.49 mg. per gram for currant and strawberry juices, respectively), but that this progressively decreased during storage, the rate of destruction being more rapid at the higher storage temperatures. Color measurements in a Lovibond colorimeter showed the red and yellow colors in the juices to be reduced during storage, the red at about the same rate at which the ascorbic acid was destroyed. After the initial loss of yellow color its intensity was increased. Differences in temperature of pasteurization or in method of extraction were found to have little effect on the changes occurring during storage. The presence of air in the bottled juices caused a marked increase in destruction of ascorbic acid and had some effect on the change in color. Since ascorbic acid is oxidizable and pigments reducible, the results suggested that they may have reacted with each other. Addition of ascorbic acid or isoascorbic acid to strawberry juice before pasteurization and bottling increased the rate of color change during storage in the dark as well as the rate of loss of ascorbic acid.

Buffering effect of fruit juices, C. S. Pederson and H. G. Beattie. (N. Y. State Expt. Sta.). (*Food Res., 8 (1943), No. 5, pp. 405–408, illus. 3*).—In tests with 10 different kinds of fruit juices, pH was determined with a Beckman pH meter with a glass electrode, and comparative buffering effects were shown by the buffer curves established by titration of samples of the juices with NaOH, tartaric acid, and HCl. The results showed that the fruit juices varied considerably in their buffering effect, and indicated, therefore, that the pH of fruit juice blends cannot be predicted with any degree of accuracy. No correlation was noted between buffering effect and ash content.

The food supply of Texas rural families, J. Whitacre. (*Texas Sta. Bul. 642 (1943), pp. 40, illus. 4*).—This survey of sources and kinds of foods available to rural families of the State and trends in the use of foods was made in the spring and summer of 1942 through home visits to a random selection of 400 rural families distributed among 5 counties and in 3 regions of the State and including 3 tenure groups—owners or operators, renters, and wage laborers with white and Negro families in all groups and Mexicans among the laborers in 1 group. Interviews with one or more members of the family, usually the housewife with frequent participation by the men and children, included the checking of a classified list of 201 food items as to "used" and "not used"; sources of each item as (1) produced at home, (2) purchased, and (3) other sources; and chief facilities for home production, such as total acreage farmed and amount devoted to growing of food for home use, number of gardens a year, ownership of livestock and poultry, and methods and extent of food preservation. Approximation of the family diet for each of the 17 groups of families interviewed was obtained from calculations of average daily or weekly consumption per person of foods known to be dependable sources of certain nutrients, based in part on reported frequency of eating or the usual amount eaten of specific foods and in part on the frequency of buying the customary amounts of certain items. The information thus secured is tabulated, discussed, and summarized.

Of particular interest is the indication from a comparison of the findings in this study with those of a study of the diet of Texas school children in 1927–29 (E. S. R., 71, p. 562) that trends in the use of foods during the 15-yr. interval between the two studies have been toward a better diet. "Whereas Texas school children as found in a dietary survey in 1927–29 did not meet accepted recommendations in the consumption of milk, butter, and eggs, most of these farm families had a generous supply of such foods. Consumption of leafy vegetables and whole grain preparations, while still a little too low in many farm families, averaged approximately double

that found in the previous study. The use of fruits was much the same. Increased fruit consumption is desirable."

Food preparation and preservation among rural families of Texas, J. WHITACRE. (*Texas Sta. Bul. 643 (1943), pp. 15*).—In connection with the survey noted above, an opportunity was afforded to secure information regarding the most common methods of preparation of the principal foods and the extent and type of food preservation. The data thus obtained are tabulated by region, race, and tenure groups and discussed with reference to good and poor practices from the standpoint of nutrition.

Preferred methods of preparing certain foods were strikingly similar among the different groups represented and included both good and poor practices. Among those considered good were the use of milk for cooking as well as drinking, simple baking as the favorite method of cooking sweetpotatoes, the use of pot liquor, and the frequent use of cabbage in the raw state. Poor practices included overlong cooking of greens and cabbage by some families, the use of soda in cooking beans and greens, and the extensive use of soda in making corn bread and biscuits.

Of the 400 families interviewed, 92 percent canned fruit, the kinds varying with the region, 91 percent canned vegetables with tomatoes leading in all regions, and 81 percent made preserves. The average amounts canned per person per year were 29 qt. of vegetables, 19 qt. of fruits, and 12 pt. of preserves.

Food preferences among rural Texans, J. WHITACRE (*Texas Sta. Prog. Rpt. 854 (1943), pp. 2*).—Records of foods liked, disliked, and not eaten by the members of the 400 families in the above study showed a surprising predominance of likes over dislikes for the familiar foods. The items for which the greatest number of groups registered dislikes were coffee 12 groups; carrots 11; sauerkraut, mutton, and sweet milk 8 each; chevon (goat meat) and rolled oats 7 each; and cushaw and squash 5 each. However, only four of these items (sweet milk, sauerkraut, carrots, and coffee) were disliked by as many as 50 percent or more of any group. Well-defined differences between tenure groups or racial groups appeared only in one region. "These findings, although indicating little food prejudice, point to the desirability of intensified effort to induce each individual to develop a liking for all foods which are available or can be made available easily. Availability looms large in times of food rationing. Liking foods is conducive to eating them. Only foods that are eaten can serve the purpose of nutrition."

Relation of the school lunch to child health and progress (*Florida Sta. Rpt. 1943, pp. 67–68*).—In this progress report, general information is given on the nutritional status as determined by physical examinations and blood tests for anemia and vitamin A deficiency of more than a thousand children in nine schools in two counties of the State; on the quality of the breakfasts, suppers, and school lunches of more than 600 children attending six of these schools; and on the effects of corrective measures for anemia, better food in the school lunch, and nutrition education on the health of children in two schools as compared with the third in which no measures were taken.

The initial examinations indicated that the defects of the children in the various schools differed in degree rather than kind, the most common being defects of the heart apparently associated with anemia. In one school 13 percent of the children had heart defects and 63 percent anemia, while in another the corresponding figures were 2 and 25 percent. Gingivitis varied from 25 percent of the children in the citrus growing region to 76 percent in the other regions. Eye defects, considered to be due for the most part to malnutrition, were found in 70 percent of the children in six of the schools and caries in from 78 to 91 percent of the children in the same schools. In an arbitrary system of scoring with 40 considered an adequate score for breakfast and 50 or more for the noon or evening meal, scores for noon meals in six of the schools ranged from 41 to 63 with only two below 50,

while only 5 percent had adequate home suppers and 19 percent adequate breakfasts. Milk, butter, eggs, and citrus fruits were used at home daily by less than 10 percent and not at all by more than 50 percent. Yellow and green vegetables were used by more than 67 percent.

In the school receiving special attention in the planning and preparation of the noon meal and in corrective treatment, the children who were under observation from 1940 to 1943 showed a drop in the incidents of anemia from 56 to 0 percent and of gingivitis from 73 to 5 percent. In the second school, the small number of cases of gingivitis was attributed to abundant use of citrus fruits and the anemia present at first was cured with iron and liver concentrates. In both schools successful efforts were made to demonstrate the value of better nutrition to the mothers, in the first through classes in food planning and preparation and in the second through school gardens.

Further consideration of the effect of altitude on basal metabolism: A study on young women residents of Denver, R. C. Lewis, A. Iliff, and A. M. Duval (*Jour. Nutr., 26 (1943), No. 2, pp. 175–185, illus. 1*).—Hitherto unpublished data on the basal metabolism of young women residents of Denver, Colo. (altitude 5,280 ft.), are presented and discussed in comparison with reports in the literature for similar subjects studied at localities differing in altitude from sea level to 7,148 ft. The present data comprised 90 determinations on 43 women between the ages of 17 and 26 yr., inclusive. The values are reported individually in terms of calories per 24 hr., per hour per square meter body surface, per hour per kilogram body weight, and per hour per centimeter of height. For purposes of comparison with the other data, only the values of calories per hour per square meter body surface were used. Among the total of 15 studies compared, no consistent relationship was found between the basal metabolism reported and the altitudes at which the determinations were made. The mean of 31.8 calories per hour per square meter found in the present study was almost identical with the values reported by Tilt and Walters (E. S. R., 74, p. 130) from Florida (altitude 160 ft.) and lower than the means in all of the other studies. The authors conclude that within the ranges of elevation studied altitude does not affect the basal metabolism, and express the opinion that the relatively high values in the higher elevations that have been reported in the literature as due to altitude must be attributable to some other factor.

Studies on the nutritional requirements of the rhesus monkey, H. A. Waisman, A. F. Rasmussen, Jr., C. A. Elvehjem, and P. F. Clark. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 2, pp. 205–218, illus. 2*).—The literature on the use of monkeys as experimental animals in nutrition research is reviewed, and experiments are reported in which attempts were made to rear monkeys on a purely synthetic diet supplemented with all eight of the readily available members of the B complex and ascorbic acid. The diet (M–3) consisted of sucrose 73 parts, purified vitamin-free casein 18, salt mixture 4, corn oil 3, and cod-liver oil 2 parts. The vitamin supplements, which were administered in solution before the drinking water was supplied, included thiamine hydrochloride 1 mg., nicotinic acid 5, riboflavin 1, pyridoxine hydrochloride 1, calcium pantothenate 3, choline chloride 50, *p*-aminobenzoic acid 100, *i*-inositol 100, and vitamin C 25 mg. The monkeys, weighing less than 3 kg. and not over 2–3 yr. of age as indicated by their dentition, were given tuberculin tests at intervals to assure healthy animals for the test.

On the basal diet alone, the animals showed only a transitory gain in weight followed by the leveling off of the weight curve and then loss in weight, anorexia, leucopenia, slight anemia, cachexia, and intercurrent infections, especially bacillary dysentery. The average survival period of 11 animals kept on the diet until death was 88 days. Supplementation of the basal diet with *i*-inositol and *p*-aminobenzoic acid did not alter the course of the decline, but any one of the three liver products —whole liver, liver extract, and solubilized liver residue—when fed at a 3-percent

level supported good growth, maintained the normal blood picture, and prevented dysentery and other secondary infections. Whether or not the deficiency in the basal diet is single or multiple was not established.

The role of biotin and "folic acid" in the nutrition of the rhesus monkey, H. A. WAISMAN and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 4, pp. 361–375, illus. 4*).—It is shown that the nutritional failure resulting in monkeys fed the diet noted above can be cured or prevented by a folic acid concentrate prepared from liver by the method of Hutchings et al. (E. S. R., 88, p. 175) through the first norite adsorption and elution with the ammonia-alcohol mixture. Biotin, although shown to be without effect on the growth of monkeys on this diet, was found to be necessary for the production of normal fur in the monkey and is considered to be a dietary essential for this species.

Production of riboflavin deficiency in the monkey, H. A. WAISMAN. (Wis. Expt. Sta). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 69–71, illus. 2*).—Through the use of the basal diet described above with all of the vitamins except riboflavin supplied in the daily supplement, an acute riboflavin deficiency was produced in monkeys. A freckled dermatitis (illustrated by photographs) and anemia, characterized by very low hemoglobin values and red cell counts and variable but somewhat low white cell counts, are considered to be the most striking signs of the deficiency syndrome.

Corneal vascularisation in nutritional deficiency, T. K. LYLE, T. F. MACRAE, and P. A. GARDINER (*Lancet [London], 1944, I, No. 13, pp. 393–395, illus. 1*).—The relationship between corneal vascularization and diet among the personnel of the Royal Air Force was investigated in 22 localities, 10 in Great Britain and 12 overseas. The nasal, inferior, and temporal quadrants of both eyes were examined, and four types of vascularity were considered. A method of scoring was followed in which a score was allotted to each of the six quadrants examined according to the degree of vascularity found, the scores ranging from 0 for the lowest degree of vascularity to 18 for the highest.

At the British stations, 4 in England and 6 in the Highlands and Islands of Scotland, the service rations were considered nutritionally satisfactory. In the other stations they varied widely. A table is given showing the general adequacy or inadequacy of the rations in the 12 overseas stations and the degree of vascularity in the personnel. This was the lowest where the food was good and highest where it was least satisfactory. Where fresh foodstuffs were available and there was an abundance of good vegetables and fruits, little corneal vascularity was observed. That riboflavin was not the only factor involved was shown by the high degree of vascularity observed at one station where the food served was very high in riboflavin because of large amounts of liver, eggs, and milk and the low degree of vascularity in Great Britain where the riboflavin of the diet was comparatively low, averaging 1.8 mg. daily. Five tests were carried out (in 3 stations of Great Britain and 2 overseas) in which various vitamin supplements or additional foods were given over a period of time, with eye examinations before and after. In these, there was evidence of some improvement following riboflavin treatment but no definite evidence of improvement following treatment with any of the other pure vitamins tested, with possible exception of a slight beneficial effect of nicotinamide in one test. The most definite improvement was noted in the experiment in which the diet was supplemented with a good variety of nutritious foods.

It is concluded that while vascularity of the cornea is not necessarily evidence of deficiency in the diet, the average degree of corneal vascularization in a group of subjects is a reliable index of their general state of nutrition.

The composition of sweat, with special reference to the vitamins, O. MICKELSEN and A. KEYS. (Univ. Minn.). (*Jour. Biol. Chem., 149 (1943), No. 2, pp. 479–490, illus. 1*).—Sweat was collected with great care to prevent contamination

from various parts of the body of normal young men in rest and in moderate controlled work on a motor-driven treadmill, for the most part in an atmosphere of 49° F. temperature and 25 percent relative saturation, but in some instances at a lower temperature (37°–38°) and higher humidity, 65 percent relative saturation. The sweat samples obtained in various ways, which are described, were analyzed for ascorbic acid, thiamine, and nicotinic acid, and other nutrients.

The concentration of vitamin found was of the order of ascorbic acid 0.03 mg. per 100 cc., thiamine 0.2 μg. or less, riboflavin 0.5 μg. or less, and nicotinic acid or its biological equivalents 0.1 mg. per 100 cc. No relation was found between the concentration of ascorbic acid in the sweat and in the diet or the blood plasma. It is pointed out that the low values for ascorbic acid indicate that even under the most extreme conditions of profuse sweating where the value might reach 10 l. per day the maximal loss of ascorbic acid would be less than 10 mg. "Actually, the maximal losses we have calculated from studies in the laboratory and in extreme conditions in desert maneuvers with the U. S. Army would amount to 4 mg. per day or less." The higher concentrations of ascorbic acid reported by some observers are thought to be due to the presence of other reducing substances as contaminants, such as has been shown to be the case with some types of rubber used in collecting sweat. Attention is also called to the higher values reported for thiamine by Hardt and Still (E. S. R., 88, p. 137), and it is suggested that these must be ascribed to analytical error.

Of the other constituents determined, lactate, urea, and ammonia were found to be much more concentrated in the sweat than in the blood. Sweat samples collected simultaneously from different parts of the body showed marked differences in total concentration and in the concentration of chloride, lactate, urea, creatinine, and uric acid. The concentration of chloride in the sweat was highly variable but independent of moderate variations in its concentration in the blood plasma. None of the constituents of the sweat reflected a blood concentration of the same substances unless the blood levels were markedly abnormal. Hand sweat contained 30–70 percent more chloride than the total body sweat obtained at the same time.

Ascorbic acid in sweat, E. R. KIRCH, T. CORNBLEET, and O. BERGEIM (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 3, pp. 307–308*).—Attention is called to earlier reports, including one by Cornbleet, Klein, and Pace indicating the presence of considerable amounts of ascorbic acid in sweat, and later ones of Tennent and Silber (E. S. R., 91, p. 226) and Mickelson and Keys as noted above showing the absence of ascorbic acid in the reduced form but the presence of small amounts of dehydroascorbic acid. In the present study, preliminary tests in which the sweat was collected in rubber bags showed that the high reducing values found in dye titrations did not represent ascorbic acid, for after treatment with ascorbic acid oxidase, which would destroy any ascorbic acid present, the titration values remained the same. In tests in which the sweat was collected directly into a metaphosphoric acid solution, eight subjects were on a regular diet plus 100 mg. of ascorbic acid daily and six received 500 mg. of ascorbic acid 30 to 45 min. before sweating. Only one of each group showed any ascorbic acid in the sweat and the quantity in each case was practically negligible. Dehydroascorbic acid was present in most samples, but in too small amounts to suggest depletion of vitamin C through excessive sweating.

Synthesis of vitamins by microorganisms in relation to vitamin content of fancy cheeses, P. R. BURKHOLDER, J. COLLIER, and D. MOYER (*Food Res., 8 (1943), No. 4, pp. 314–322, illus. 2*).—Yeasts, molds, and bacteria, isolated from Camembert, Liederkranz, Brie, and Limburger cheeses, and *Oidium lactis* and *Bacterium linens* were studied in chemically defined media and in media enriched with liver concentrate. The observed growth responses and vitamin requirements of the organisms indicated that many were capable of growing well in media with or without vitamins. *B. linens*, however, showed a deficiency for pantothenic acid, a bacterium

isolated from Liederkranz required nicotinic acid, and a yeast from Camembert required biotin. Assay of the combined culture medium and organism after a week's growth of the latter in the chemically defined medium suggested that considerable quantities of certain vitamins accumulated in the organisms and their environment in this period of rapid growth. These observations suggested that the cheese organisms could contribute considerable amounts of these vitamins to the cheese. Preliminary to microbiological assay of cheeses to determine whether this vitamin development occurred, tests were conducted to determine to what extent substances in cheese extract might interfere with the assays for niacin and riboflavin in cheese. The growth and acid products of *Lactobacillus arabinosus* in a basal medium supplied with cheese extracts from Liederkranz or Limburger cheeses appeared to be proportional to the amount of nicotinic acid in the extracts up to a certain maximum. The same results were obtained with *L. casei* with respect to riboflavin. Microbiological determinations, by methods noted of thiamine, riboflavin, biotin, and nicotinic acid in extracts from the surface and core of the green curd and the ripe cheeses gave data showing that these vitamins increased in the surface layers with ripening of the cheeses. This evidence suggested that these B vitamins were synthesized by the micro-organisms and stored in the outer portions of the cheeses during the curing period.

[Vitamin A and C activity of Florida foods] (*Florida Sta. Rpt. 1943, pp. 65–67*).—Data are reported for the carotene and ascorbic acid content found in 10 vegetables, including several varieties of some, and 4 wild greens, all designated as to place of origin.

Carotene content of fresh and frozen green vegetables, F. P. Zscheile, B. W. Beadle, and H. R. Kraybill. (Ind. Expt. Sta.) (*Food Res., 8 (1943), No. 4, pp. 299-313*).—Carotene was determined by the method of Beadle and Zscheile (E. S. R., 88, p. 434), which involved extraction of the sample with diacetone alcohol at room temperature, transference of the carotene pigments to hexane, leaving the chlorophylls and carotenols in the aqueous diacetone alcohol, followed by spectrophotometric analysis of the washed, dried hexane solution using wave lengths 4,360 and 4,780 a. u; in most cases total carotene pigments were calculated from observations at 4,360 a. u. and the percentage β-carotene from those at 4,780 a. u. A study was made of the carotene contents of spinach, asparagus, broccoli, beet leaves, peas, green beans, and lima beans, the vegetables being analyzed at different stages of development and after various periods (up to 2 yr.) of storage at low temperature (—20° C. in the dark) after quick freezing. In some cases blanched samples were compared with unblanched. The results are presented and discussed in detail. In the fresh state, the spinach, beet greens, and broccoli leaves were high in carotene, the spinach containing 51.1γ–87.0γ total carotene per gram (moist basis), the beet leaves 51.1γ, and the broccoli leaves 97.5γ; broccoli flower heads and stems contained much less carotene than the leaves, so that the whole sample averaged only 25γ total carotene per gram. In these vegetables, β-carotene constituted about 85–92 percent of the total. Asparagus and peas contained respectively 4.11γ–16.5γ and 3.86γ–6.06γ total carotene per gram, with 75–86 percent of this as β-carotene; while snap beans and lima beans were the lowest in total carotene, containing respectively 1.98γ–15.0γ and 0.32γ–5.70γ per gram, with 53–79 percent in the form of β-carotene. Both total carotene and the percentage of β-carotene decreased during frozen storage but, in general, the frozen vegetables that had been blanched before freezing retained their carotene better than did the unblanched samples. In the case of blanched spinach, losses were small during the first 6 mo. of low-temperature storage but appreciable after 12 mo., and much greater after 2 yr. Without blanching, the losses were much greater. Varietal differences were small. In both snap beans and lima beans the carotene content decreased rapidly as maturity approached, but this difference between young and mature tissue was not evident in the other vegetables. Dur-

ing commercial processing of lima beans preparatory to quick freezing some losses occurred. Different commercial grades varied widely in carotene content.

The influence of large doses of vitamin A upon the plasma vitamin A level, F. STEIGMANN and H. POPPER (*Amer. Jour. Med. Sci., 207 (1944), No. 4, pp. 468-476, illus. 4*).—This paper reports a study of several factors which may influence the response of plasma vitamin A levels to the ingestion of high doses of vitamin A, termed the tolerance curve. The subjects were hospital patients with various diseases. Each was given 75,000 I. U. of vitamin A ester in 2 cc. of oil mixed with fruit juice, or the vitamin in other forms and by other routes as called for by the particular test. Plasma A levels were determined before and 3, 6, and 24 hr. after the dosage. The procedures followed were as described earlier (E. S. R., 91, p. 365).

The shape of the tolerance curve was found not to be necessarily related to the fasting plasma vitamin A level. Patients with fasting level below 40 μg. per 100 cc. occasionally gave no response. No apparent relation was found between the fat and cholesterol concentration of the blood and the vitamin A tolerance curve, and neither the lipids themselves nor cholesterol rose after administration of the vitamin. Only a slight difference was noted in the maximal increase in the tolerance curve when the vitamin was given as the ester or the alcohol. Doses of carotene had only a minimal effect on the vitamin A tolerance curve, although the plasma carotene level was slightly elevated. No response in the tolerance curve was noted after intramuscular injection of vitamin A. In only 2 cases out of 14 was the plasma vitamin A level higher 24 hr. after intramuscular administration than prior to it. The simultaneous administration of the antioxidant vitamin E with vitamin A was followed by some variations in the tolerance curve. These, however, were in both directions, giving similar averages.

Get your B-vitamins from meat, W. J. PETERSON, D. E. BRADY, and A. O. SHAW (*Res. and Farming [North Carolina Sta.] 2 (1944), Prog. Rpt. 2, p. 8*).—The contribution of meats to the total dietary supply of thiamine and riboflavin is discussed, with data from the authors' laboratory showing the distribution of these vitamins in various cuts of pork and beef and losses in the cooking of certain cuts.

Bound pyridoxine (vitamin B_6) in biological materials, L. SIEGEL, D. MELNICK, and B. L. OSER (*Jour. Biol. Chem., 149 (1943), No. 2, pp. 361-367, illus. 1*).—The method of R. J. Williams, R. E. Eakin, and J. R. McMahan[1] for the biological assay of pyridoxine based on turbidimetric measurements was found to be complicated by excessive growth of the micro-organism *Saccharomyces cerevisiae,* Gebrüder Mayer strain, due to the presence of pyridoxine remaining in the yeast or liver supplements. Treatment of the solutions of these supplements with Lloyds' reagent freed them from pyridoxine but also absorbed other essential growth factors. To compensate for these losses, the biotin and casein hydrolysate contents of the medium were increased. Additions of riboflavin, choline, and nicotinic acid, however, failed to influence the growth of the micro-organism. Tryptophan, found to be an essential growth factor, was also added to the medium. These modifications and other details of the procedure, involving the addition of minerals and asparagine, precautions to prevent pyridoxine destruction by exposure to light, and preparation of the test material for assay, are described. Autoclaving the test sample in solution or suspension for 30 min. at 15 lb. pressure in 2 N H_2SO_4 was selected as the most desirable procedure for hydrolyzing bound pyridoxine. The concentrations of free and total pyridoxine in a variety of biological materials are listed.

Ocular signs of riboflavin deficiency, W. J. W. FERGUSON (*Lancet [London], 1944, I, No. 14, pp. 431-433, illus. 2*).—Attention is called to misinterpretation of ocular signs and symptoms in relation to riboflavin deficiency "through lack of experience in the use of the slit lamp, through imperfect understanding of the normal variations

[1] Tex. Univ. Pub. 4137 (1941), pp. 24–26, illus. 1.

of the appearance and vascularity of the limbus, and through inclusion of corneal vascularization due to other causes than riboflavin deficiency." Variations in the normal limbic capillary distribution are discussed, and the type of vascularization which in the author's opinion is attributable to riboflavin deficiency is described in detail, with data on its incidence in four groups of subjects reporting at the hospital for treatment. Abnormal corneal vascularization of a clinically recognizable type and with very mild symptoms was found in 7.8 percent of 422 subjects. Among 250 out-patients examined in the ophthalmic department of the Royal Infirmary, Sheffield, 20 were found to have corneal vascularization attributed to riboflavin deficiency. Mild photophobia with a heavy or burning sensation was the outstanding symptom in 14, while in 3 there was some lacrimation and in 7 visual fatigue was easily induced. In 13 who were treated with riboflavin, 3 mg. doses daily reduced these symptoms but caused only slow improvement in corneal circulation, and 10 mg. doses daily led to much more rapid diminution in the circulation, usually complete in 3–4 weeks.

Effect of methods of cooking on the thiamin and niacin content of pork (*Kentucky Sta. Rpt. 1943, pp. 40-41*).—This is a preliminary report of a study conducted as a part of the national cooperative project on the conservation of the nutritive value of foods. The results obtained suggested that the greatest losses of thiamine and niacin occurred in boiling and the least in frying, and that long, slow heat caused more destruction than short, high heat. Boiling resulted in more retention of thiamine in liver than in any of the other cuts, least in ham. Roasted spareribs retained more thiamine than any of the other roasted cuts.

Stability of thiamine to heat, I, II (*Jour. Biol. Chem., 149 (1943), No. 2, pp. 339-347, illus. 7; pp. 349-354, illus. 1*).

I. *Effect of pH and buffer salts in aqueous solutions,* B. W. Beadle, D. A. Greenwood, and H. R. Kraybill.—"Results of chemical and spectrophotometric examination of nearly 200 solutions of pure thiamine indicate that the stability of thiamine to heat is a function not only of pH but also of the electrolyte system involved. At pH 5.4, during 1 hour's heating in boiling water there was 100 percent destruction of the thiamine in the presence of borates, 57 percent destruction in unbuffered aqueous solution, 10 percent destruction in the presence of acetates, and 3 percent in phosphate solution. In each type of solution, destruction rose from 0 to 100 percent within the range of 2 to 3 pH units during 1 hour's heating period."

II. *Effect of meat-curing ingredients in aqueous solutions and in meat,* D. A. Greenwood, B. W. Beadle, and H. R. Kraybill.—Data are presented to show the effect of heating aqueous solutions of thiamine at 98° C. for 1 hr. in the presence of salt, sodium nitrate, sodium nitrite, sucrose, and dextrose, singly and in combination, and in concentrations found in cured meats. From 19 to 100 percent of the thiamine was destroyed when heated in the presence of salt in unbuffered and phosphate-buffered solutions. In the buffered solution studies were made at pH values of 5.6 and 6.1 because these levels are frequently encountered in fresh and cured meats. A loss of 12 to 69 percent of the thiamine occurred when the vitamin was heated in aqueous solutions in the presence of 0.02 to 0.1 percent sodium nitrite. With these curing agents—salt and sodium nitrite—the destruction of the thiamine was a function of the concentration of the curing agent and the pH of the medium. Sodium nitrate, sucrose, and dextrose effected no destruction of the thiamine. Destruction of the thiamine during heating in aqueous phosphate buffer solution was about the same in the presence of combinations of the curing substances as in 3 percent salt.

The effect of heating thiamine as it occurs in meat in the presence of meat-curing substances was investigated in a series of tests in which finely ground pork mixed with solutions of the curing substances, singly or in combination, was heated for 1 hr. at 98° (and cooled promptly) either immediately after mixing or after 10 days of curing at 0°–2°. There was no significant difference in the loss of thiamine when

the lean pork was heated in the presence or the absence of the meat-curing ingredients or in the loss of thiamine in fresh lean pork and cured (10 days) lean pork. In the absence of curing agents, the heating loss of thiamine in lean pork ranged from 16.5 to 18 percent and in the presence of curing ingredients from 16.5 to 21.1 percent.

Thiamin content of fresh and frozen peas and corn before and after cooking, B. Barnes, D. K. Tressler, and F. Fenton. (N. Y. State Expt. Sta. coop. Cornell Univ). (*Food Res., 8 (1943), No. 5, pp. 420-427*).—Three varieties of peas and two of corn were used in these studies to determine changes in thiamine content of the freshly harvested vegetables as held under laboratory or commercial freezer plant conditions for a few hours previous to use, as prepared, blanched, frozen, and held in freezing storage under commercial conditions, and finally as cooked either in the fresh or the frozen state. Thiamine was determined by the modified thiochrome method of Moyer and Tressler (E. S. R., 88, p. 438). In the freshly harvested state the peas contained from 3.95 to 4.50 μg. of thiamine per gram, and the corn cut from the cob 1.55 to 1.75 μg. per gram. Holding the fresh peas, shelled or unshelled, and the fresh unhusked corn at room temperature for 5 hr. did not result in loss of thiamine. During preparation for freezing, which included blanching, a small amount of thiamine was lost, but neither freezing in a Birdseye multiplate freezer at —28° F. nor storage at —7° to —10° for 1 yr. caused further loss. The stored frozen peas contained from 2.80 to 3.70 μg. of thiamine per 100 gm., and the stored frozen corn 1.22 to 1.24 μg. per 100 gm. There was no destruction of thiamine in cooking the fresh and the frozen corn and peas in 300-gm. lots in 100 gm. of water for short periods (2–10 min. in the various tests), although some of the thiamine dissolved in the cooking water. The peas retained from 72 to 84 percent of thiamine and the corn 76–85 percent under these conditions. The rest of the thiamine, 28–18 percent and 25–15 percent, respectively, according to analysis was found in the cooking water. When the peas, and likewise the corn, were placed in 600 gm. of water for cooking, the amount of thiamine dissolved in the cooking water increased to 34 percent, with a corresponding retention of 64 percent in the peas. The cooked peas (drained) in the various tests contained from 2.47 to 4.20 μg. of thiamine per gram and the cooked corn 0.76 to 1.18 μg. per gram.

Thiamine in beef muscles: A comparison of values by the thiochrome reaction applied with and without adsorption, W. F. Hinman, E. G. Halliday, and M. H. Brookes (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 2, pp. 116-120, illus. 1*).—Thiamine in various cuts and grades of beef muscle was determined by the nonadsorption technic of Harris and Wang (E. S. R., 87, p. 762) and by the base-exchange technic of Hennessey and Cerecedo (E. S. R., 82, p. 588). Although differences between the Harris and Hennessy values often amounted to 40–100 percent of the Hennessy value, differences of not more than 20 percent could be explained by incomplete adsorption, resulting in low Hennessy values, when only 2–5 μg. of beef thiamine were available for adsorption per column. Comments are made on enzyme digestions and on the Harris thiochrome reaction. A few comparisons with yeast fermentation values are also included.

Influence of the level of thiamine intake on the susceptibility of mice to poliomyelitis virus, A. F. Rasmussen, Jr., H. A. Waisman, C. A. Elvehjem, and P. F. Clark. (Univ. Wis.). (*Jour. Infect. Diseases, 74 (1944), No. 1, pp. 41–47, illus. 5*).—Swiss mice fed diets deficient only in thiamine showed a lower incidence of infection to Theiler's encephalomyelitis virus and to the Lansing strain of poliomyelitis virus than did others fed a similar diet with optimum thiamine content. The decrease in susceptibility to both viruses is similar to but more marked than the decreased susceptibility noted in mice on diets restricted in calories but adequate in all vitamins. In some instances the survivors on the thiamine-deficient diet, when subsequently given adequate thiamine, became paralyzed after a prolonged incubation period.

Influence of pantothenic acid deficiency on resistance of mice to experimental poliomyelitis, H. C. Lichstein, H. A. Waisman, C. A. Elvehjem, and P. F. Clark. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 56 (1944), No. 1, pp. 3-5*).—In tests similar to the above involving in two series a total of 348 Swiss mice, a deficiency of calcium pantothenate increased resistance to Theiler encephalomyelitis but little or none to the Lansing strain of poliomyelitis. Two possibilities are suggested in explanation of the unlike effect on the two viruses—(1) that in pantothenic acid deficiency there is a depletion of some metabolite necessary for the propagation of Theiler virus but not the Lansing virus, and (2) that there is an accumulation of a metabolite inhibitory to the former virus but not to the latter.

On sources of vitamin C, I, II (*Canad. Jour. Res., 21 (1943), No. 12, Sect. C, pp. 363-373; 22 (1944), No. 2, pp. 33-37*).

I. *Rose hips,* J. Tuba, G. Hunter, M. J. Hutchinson, and L. L. Kennedy.—Ascorbic acid in the flesh of the rose hips was determined by 2,6-dichlorophenolindophenol titration of an extract prepared by grinding the material with 2 percent HPO_3 in 2 N HCl. To avoid species and varietal differences, determinations were carried out on hips picked from a single bush. A single ripe rose hip with stalk and flower residues removed averaged about 1 gm. in weight, and about two-thirds of this was flesh and one-third seeds and hairs, although the proportion differed, especially with variety. The ascorbic acid content of the flesh was found to vary with maturity, 666, 982, and 1,275 mg. percent, for example, having been found in green, semiripe, and ripe hips, respectively, from one bush. Of the newly ripe hips of wild roses, gathered during fall and winter in Edmonton, Alta., those of *Rosa acicularis* contained from 1,800 to 3,500 mg. percent ascorbic acid on the moist basis, or about 4.5 to 7.6 percent on a dry basis. The corresponding range for *R. woodsii* and *R. arkansana* was 1,300 to 2,000 mg. percent. Later in the season as the fruit deteriorated on the bush, becoming dehydrated or moldy, the ascorbic acid values decreased. The hips from cultivated roses contained less ascorbic acid than the wild varieties with the exception of *R. laxa,* the richest examined, with 3,000 to 4,000 mg. percent in the wet flesh or 8.0 to 10.3 mg. on a dry basis.

A study of ascorbic retentions in relation to preserving method showed a fairly rapid loss of the vitamin and deterioration of the hips held in the refrigerator at 5° C.; about 80 percent retention of the vitamin upon boiling the dried powdered flesh in water for 15 min. and only slightly lower retentions with longer boiling; very good retention over 6 mo. in rose hips preserved in potassium metabisulfite solution; about 80 percent retention in rose hip flesh dehydrated at 80° (powders containing as much as 5.3 percent ascorbic acid being obtained in this way), but with 18–45 percent loss in dried flesh or 10–30 percent in powdered material held in the refrigerator 2–10 mo. A rose hip-crab apple jelly contained about 200 mg. ascorbic acid per 100 gm. and retained this very well over a 10-mo. storage period in an ordinary fruit cellar. The leaves and bark of wild rose bushes commonly contained 300–500 mg. percent ascorbic acid in the fresh matter, and the petals 20–70 mg. percent.

II. *Alberta native fruits,* J. Tuba, G. Hunter, and L. L. Kennedy.—This paper reports the data obtained for ascorbic acid in 21 wild Alberta fruits designated by common and botanical name and described as to place of origin and degree of maturity. The values in milligrams percent for the most widely occurring and most generally used wild fruits were as follows: Blueberries 5–18, chokecherries 5–19, highbush cranberries 8-51, pin cherries 8–34, raspberries 14–40, and saskatoon (service) berries 5–38. A few wild fruits not commonly eaten were also analyzed and in addition a number of miscellaneous plant materials, including leaves, seeds, pods, or other parts of 10 plants designated by common and botanical names.

The vitamin C content of commercially canned fruit and vegetable juices, M. C. Smith (*Arizona Sta. Mineog. Rpt. 64 (1944), pp. 3+*).—Ascorbic acid was determined by the method of Morell in 29 different commercially canned fruit and

vegetable juices purchased at local markets (Tucson, Ariz.). The results, expressed in terms of the average amount of ascorbic acid contained in ½ cup of each of the canned juices, showed that these juices varied greatly and that orange, lemon, and grapefruit juices were the richest, containing, respectively, 50, 46, and 42 mg. Papaya fruit and tomato juices contained from 20 to 37 mg. and sauerkraut and spinach juices from 12 to 16 mg., while all the other juices were very low in ascorbic acid, containing from none at all to not more than 9 mg.

Protein-ascorbic acid complex in carrots, F. DeEds. (U. S. D. A.). (*Food Res., 8 (1943), No. 4, pp. 275–279, illus. 2*).—Carrots, after complete removal of free ascorbic acid by extraction with 3 percent metaphosphoric acid in a Waring blender, yielded a residue from which more ascorbic acid could be obtained by hydrolysis (boiling for 5 min. with 3 percent metaphosphoric acid under a reflux condenser) or enzyme digestion (treatment with chymotrypsin at pH 6.5 for 15, 30, and 60 min.). Ascorbic acid was determined in the original extract and in the solutions obtained in the hydrolysis or digestion experiments by the photoelectric adaptation of the 2,6–dichlorophenolindophenol method. The rapidity of the dye reduction, within 15 sec., indicated that the reducing substance liberated from the carrot residue by the acid or enzyme digestion was ascorbic acid. This view was further supported by the destruction of the liberated reducing substance by continued acid hydrolysis or prolonged enzyme action (18 hr.), an expected result probably due to respective acid hydrolysis or oxidation of the ascorbic acid. The reaction taking place in the presence of the chymotrypsin was found to be a time reaction of the first order, suggesting the liberation of something nonprotein—in this case the ascorbic acid—from a protein complex, because strict proteolysis is usually not a first-order process.

"The results obtained with carrots agree with the claims of others that certain vegetables contain protein-combined ascorbic acid. Investigations on the general occurrence of such combined ascorbic acid should be extended. Since ascorbic acid in this form is biologically available, it must be taken into consideration in determining the value of different foods and in comparing the bioassay and chemical methods. The degree of protection which such a combination may afford ascorbic acid during dehydration and processing of food is worthy of investigation."

Relation of time of applying fertilizer to content of ascorbic acid and of nitrogen in potatoes (*Kentucky Sta. Rpt. 1943, pp. 39-40*).—This preliminary report of a factorial design experiment indicates that potatoes from plats receiving no fertilizer contained less ascorbic acid and less nitrogen than those from the fertilized plats; those fertilized with manure had less ascorbic acid and nitrogen than those fertilized with nitrate of soda. Fertilization at the beginning of the experiment resulted in the highest content of these nutrients.

Vitamin C and minerals in 4 varieties of turnip greens, L. McWhirter and M. Gieger (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 7, p. 2*).—The turnip greens used for this study were grown at State College during the spring and fall of 1943; all four varieties were grown on the same plat of soil and were harvested twice in each season, once at the stage of growth at which the first greens would be picked, and again when the plants had matured but were still tender and succulent. Greens of the Shogoin and Seven Top varieties were richest in ascorbic acid, averaging, respectively, 143 and 142 mg. per 100 gm. fresh basis; Pomeranian and Purple Top Globe averaged, respectively, 132 and 129 mg. ascorbic acid per 100 gm. Seven Top and Pomeranian varieties averaged 3.6 and 3.2 mg. Fe per 100 gm. fresh basis, and Purple Top Globe and Shogoin 2.8 and 2.9 mg.; Ca values for these four varieties, respectively, averaged 0.39, 0.35, 0.33, and 0.29 percent, and P values 0.079, 0.077, 0.074, and 0.056 percent.

A new growth factor for Streptococcus lactis, J. C. Keresztesy, E. L. Rickes, and J. L. Stokes (*Science, 97 (1943), No. 2525, p. 465*).—A comparison of the

amount of folic acid and norite eluate factor in various types of extracts and liver preparations showed that some of the materials were much more active for *S. lactis* R than for *Lactobacillus casei,* while a spinach extract, in contrast, had the same degree of activity for both organisms. This difference was shown to be due to the presence of another substance, now isolated, which effectively replaced the folic acid in the case of *S. lactis* but was inactive for *L. casei.* It is believed that the newly isolated substance was not folic acid or the norite eluate factor, but a new growth factor.

Some properties of a growth factor for Lactobacillus casei, E. L. R. Stokstad (*Jour. Biol. Chem., 149 (1943), No. 2, pp. 573-574, illus. 1*).—Preparations of a "norite eluate factor" obtained from yeast and liver gave crystalline methyl esters which when converted to their free acids gave compounds with the same absorption spectrum in 0.1 N NaOH, pH 7.0. The esters when hydrolyzed yielded preparations which had equal potency for *L. casei* ε. When assayed with *Streptococcus lactis* R by the method of H. K. Mitchell and E. E. Snell[1] the preparation from yeast was only half as active as that from liver. The methyl ester from liver had the composition C 52.7, H 4.8, N 20.1, and is thought to be identical with the compound obtained from liver by Pfiffner et al. (E. S. R., 91, p. 186). The amount required for half maximum growth of *L. casei* ε was 0.000055γ per cubic centimeter of medium, also in good agreement with the results of Pfiffner et al. The preparations appeared to differ from those of Keresztesy, Rickes, and Stokes, noted above.

TEXTILES AND CLOTHING

Sampling and measuring methods for determining fineness and uniformity in wool, E. M. Pohle, L. N. Hazel, and H. R. Keller (*U. S. Dept. Agr. Cir. 704 (1944), pp. 14, illus. 5*).—Wool samples from 6 body regions on each of 10 Rambouillet yearling ewes were examined by the cross-section method to study the efficiency of sampling methods and of methods of measuring mean diameter and uniformity of individual fleeces. Variations in fiber diameter associated with sheep, body regions, levels along the fiber, and the various interaction terms were found to be statistically significant. Standard errors calculated from theoretical formulas indicated that samples of completely randomized fibers would be more efficient in both number of cross sections prepared and fibers measured than samples from controlled body regions or levels along the fiber. Since obtaining samples of completely randomized wool fibers from individual fleeces appeared to require opening and mixing of the whole fleece, a modified method of blending fibers from definite body regions, suitable for the usual wool laboratory, was studied. Indications were that the fibers could be mixed adequately by hand carding small locks of wool from different body regions. Accuracy of single estimates of fineness by the count and rapid comparator methods was equivalent to that of measuring about 75 and 62 fibers, respectively. Both are much faster to apply than measuring an equivalent number of fibers. Both short-cut methods were accurate enough to distinguish between uniform and variable fleeces.

Make-overs from coats and suits, C. L. Scott (*U. S. Dept. Agr., Misc. Pub. 545 [1944], pp. 15, illus. 45*).—The problem of make-overs from coats and suits is illustrated by special cases presented after preliminary consideration of the essential steps of sizing up the old garment, renovating the material, and choosing the pattern. This publication supersedes Leaflet 230 (E. S. R., 88, p. 718).

Challenge to ingenuity, C. L. Scott. (U. S. D. A.). (*Jour. Home Econ., 35 (1943), No. 10, pp. 617-620, illus. 5*).—The rules given for the remodeling of old garments are covered more fully in the publication noted above.

[1] Tex. Univ. Pub. 4137 (1941), pp. 36–37, illus. 1.

REPORTS AND PROCEEDINGS

Annual Report [of Florida Station], 1943, W. Newell. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1943, pp. 224+, illus. 20*).—In addition to items noted elsewhere in this issue, brief progress reports are given on the various projects of the station, substations, and field laboratories in agricultural economics, agronomy, animal industry, entomology, plant pathology, and soils. Among the many specific projects for which data are reported are those on cost of production and grove organization for Florida citrus; crop varieties, improvement, fertilizers, and rotations; pasture and turf studies; mineral nutrition of plants and livestock; tung-oil investigations; local feeds and their utilization; citrus and avocado culture; melanose and stem-end rot of citrus; trials of herbs and herbaceous plants; and rubber possibilities of *Cryptostegia* and Russian dandelion.

Fifty-sixth Annual Report [of Kentucky Station], 1943, T. P. Cooper (*Kentucky Sta. Rpt. 1943, pp. 64*).—In addition to items covered elsewhere in this issue, this report notes briefly progress results on farm organization and marketing, including possibilities of Kentucky agricultural production for war, post-war needs and opportunities in Kentucky agriculture, analysis of farm business in Union, Henderson, and Daviess Counties, trends in Kentucky farmland values, simplification of farm labor practices, farm labor demand and supply, farm wages in Kentucky, exchange and custom use of farm machinery, improvement of transportation practices in farm and food products, and turkey marketing methods and prices; livestock feeding, management, and diseases, including digestible nutrients in bluegrass-molasses, alfalfa-molasses, and corn silages and their use as roughages for steers, Reid Yellow Dent v. U. S. 13 yellow hybrid corn for fattening steers, forage consumption of grazing steers, bovine and ovine parasites, distiller's wheat slop for pigs, botulism and nutritional deficiencies in swine, early v. late cutting of Korean lespedeza for dairy cows, reproductive efficiency in dairy cows, alternate v. continuous grazing of permanent pastures by dairy heifers and unweaned spring lambs, silage v. alfalfa hay for pregnant ewes, barn feeding v. grazing for late lambs, effect of shearing on gains and market quality, phenothiazine-salt mixture for late lambs on pasture, fresh rock phosphate and other phosphates for chicks, vegetable v. animal protein for growing pullets, appetites of hens for bluegrass forage, simplified methods of feeding pullets, H-ion concentration of the digestive tract of chickens, and *Salmonella* bacterial studies; soils and crops, including work with Kentucky bluegrass, orchard grass, meadow fescue, red clover, hybrid v. open-pollinated corn, hardiness of winter barley and oats, effect of retting on hemp fiber, a machine for beating out hemp seed, castor-beans, soil fertility, greenhouse tests of fused rock phosphate, nitrogen fertilizer for tobacco, potash from manure and crop residues, tobacco stalks for fertilizer, pasture, fertilization, tests of a hay drier, and varieties, diseases (frogeye leafspot, angular leafspot, and wildfire), and curing of tobacco; orchard and truck crops (apples, peaches, raspberries), seed peas (fungicide treatment), hormones for tomatoes, oil treatment for corn earworm, and relation of soluble N in tissue of potato vines to yield; insect control, including *Miris dolobratus,* grubs of green June beetle and May beetles, white grubs, methyl bromide fumigation of strawberry crown borer, codling moth, tomato fruitworm, plum curculio, oriental fruit moth parasites, and chicken lice; chemical research with tobacco-seed oil, nicotine dust as an insecticide, nicotinic acid production by oxidation of nicotine, growing tobacco for nicotine, uses for low-grade tobacco, equine incoordination (wobbles), effect of Mn intake on urea excretion, ascorbic acid synthesis, and bisulfite-binding substances in blood, effect of Cu, B, Mn, and Zn on enzyme activity and yield of alfalfa, Cu in growth of tomato, and relation of low boron to reproduction of rats and on the soluble N and carbohydrate content of alfalfa; yields of corn hybrids and wheat varieties, pasture experiments, legume N v. fertilizer N for

crops, apple variety and cover-crop tests, peach and strawberry varieties and culture, and farm woodlot demonstrations at the Princeton Substation; and sorghum sirup production at the Robinson Substation.

Science serves in war: Fifty-sixth Annual Report of the [Maryland] Agricultural Experiment Station, 1942-1943, R. B. CORBETT (*Maryland Sta. Rpt. 1943, pp. 47+, illus. 7*).—In addition to a note on mechanical farm equipment noted on page 752, this report includes brief accounts of the progress of research on farm organization and management, including dairy farm returns, farm machinery supplies, farm labor problems, farm taxation and finance, farm prices, quality and price of canned vegetables, and transportation of farm products; farm crops and soils, including hybrid v. open-pollinated corn, varieties of sweet corn, wheat, barley, and soybeans, liming materials for the Coastal Plain, nitrogen for small grains, and value of legumes in small grain stubble; beef cattle, sheep, and hogs, including corn, barley, and wheat for steers, corn silage for pregnant ewes, and salt penetration in hams; diseases of animals, including Bang's disease, brucellosis of swine, and control of mastitis; plant diseases, including potatoes, cantaloups, and strawberries; dairy cattle and dairy products, including kelp meal in dairy rations, dry starters for dairy calves, vitamin A and carotene requirements of calves, and vitamins in spray-dried whole milk powder and butter; insect control work with the pea aphid, corn earworn for beans, and Japanese beetle; fruit and vegetable crops, including dehydration of sweetpotatoes, peas, sweet corn, lima beans, and apples, resistance of peach buds to winter injury, and causes of abnormal growth and fruiting behavior, strawberry culture, tomato varieties, fertilizer placement for tomatoes and peas, edible soybean culture, and growing and harvesting sage; and poultry, including soybean meal tests, riboflavin sources and relation to hatchability, feeding value of byproducts from manufacture of industrial alcohol, response of turkey poults and chickens to vitamin D, relation of hatchability of chicken and turkey eggs to specific gravity, price relationship between drawn and cut-up chicken, cooling eggs, breeding chickens for efficiency in feed utilization and resistance to pullorum disease, role of wheat in pullet disease, gas fumigation of used baby chick boxes, and preventing breast blisters in battery-brooded chickens.

Fiftieth Annual Report [of Minnesota Station], 1943, C. H. BAILEY (*Minnesota Sta. Rpt. 1943, pp. 31*).—Among other administrative data, this report lists the station publications of the year.

Informe de la Estación Experimental de Puerto Rico, 1943. [K. A. BARTLETT ET AL.] (*Puerto Rico Sta. Rpt. 1943, Span. ed., pp. 42+*).—A Spanish edition (E. S. R., 91, p. 369).

Agricultural research in South Dakota: Fifty-sixth annual report [of the South Dakota Station, 1943], I. B. JOHNSON ET AL. (*South Dakota Sta. Rpt. 1943, pp. 58+, illus. 8*).—In addition to an item noted on page 762, progress reports are made on studies of phosphorus in fertilizers; deep plowing; adding organic matter to soils; breeding oats, sorghum, hybrid corn, alfalfa, soybeans, and potatoes (for late-blight resistance); culture of *Agropyron intermedium* and native legumes; weed control; resistance of cereals to blight; seed treatment of sorghum; seedling blight and root rot of grasses; *Aphanomyces cochlioides* on sugar beets; culture of *Hyoscyamus* and *Ephedra;* creep feeding beef calves; feeding range beef cows and fattening lambs; soft corn for fattening beeves, lambs, and pigs; swine breeding; lambing off corn and sorghum; sorghum fodder for wintering breeding ewes; hydrogen sulfide and bloat; legume-sorghum v. corn silage; sulfanilamide for bovine mastitic udders; fat globule agglutination in milk; vitamin D deficiency in dairy cows and content in alfalfa hay; control of Se poisoning in cattle and poultry; protein and phosphorus content of western wheatgrass and blue grama grass; high subsoil nitrates as a cause for poisonous oat hay; hatchability of turkey and chicken eggs; value of high-protein mashes in egg production; grain and forage sorghums

and proso millet for turkeys; cultural studies with tomatoes and other vegetables; clean cultivation for shelterbelt trees; survival of conifer seedlings; insecticidal value of *Amorpha fruiticosa;* grasshopper studies; control of blister beetle; storage of grain sorghum; painted v. galvanized iron posts; freezer-locker storage of strawberries; potato varieties for boiling and baking; serviceability of wool; family relationships in South Dakota; growth and rubber production of kok-saghyz; and soil erosion control.

MISCELLANEOUS

Mississippi Farm Research, [July 1944] (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 7, pp. 8*).—In addition to several articles noted elsewhere in this issue, this number contains Weather Summary for June, by R. Woodburn (p. 1); Crop Prices Continue at High Levels, by D. G. Miley (p. 1); More Station Publications To Meet War Needs of Farmers (p. 1); Research on Wartime and Post-War Economic Problems, by F. J. Welch (pp. 1, 7); and Directors' Annual Report: Part 1, The Central Station (pp. 1, 3–6), also to be issued in bulletin form.

Research and Farming, [January and April 1944] (*Res. and Farming* [*North Carolina Sta.*], *2 (1944), Nos. 1, pp. 12, illus. 6; 2, pp. 12, illus. 8*).—In addition to articles noted elsewhere in this issue, No. 1 contains More Beef From Less Foods Suitable for Human Use, by J. E. Foster (pp. 4–5); Breeding Poultry for Superior Performance, by R. S. Dearstyne (pp. 6–7); Lime—The Foundation for Building Soil, by R. W. Cummings (pp. 9–10); Earworms and Shatterworms, by B. B. Fulton (p. 11); and Turning the Spotlight on Egg Marketing, by H. A. White (p. 12). No. 2 also contains Controlling the Plum Curculio on Peaches, by C. F. Smith (pp. 2–3); and Developing N. C. Plant Resources—The Nursery Research Program, by L. G. McLean (p. 3).

Abstracts of new publications and list of publications available (*Oklahoma Sta., What's New in Okla. Farm Res. No. 6 (1943), pp. 10; No. 7 (1944), pp. 10*).—In addition to lists of available publications, No. 6 contains abstracts of Bulletins 244 (Sup.) and 263–268; Circulars 107–114, and Technical Bulletins 17 and 18; No. 7, Bulletins 269–275, Technical Bulletins 19 and 20, Mimeographed Publications 102–106, and Miscellaneous Publication 8. All of these have been previously noted.

Agricultura Experimental, [July-August 1943] (*Agr. Expt.* [*Puerto Rico Univ. Sta.*], *3 (1943), No. 4, pp. 12, illus. 4*).—In addition to articles noted elsewhere in this issue and reprints from other sources, this number contains Resultados de un estudio sobre el mercadeo de carnes en Puerto Rico revelan la necesidad de adoptar medidas para mejorar el abasto y distribucion de carnes [Results of a Study of the Meat Trade Reveal the Need of Adopting Methods for Improving the Processing and Distribution of Meat], by S. Díaz-Pacheco and R. Colón-Torres (pp. 6–7); and Recomendaciones para el mejoramiento de la produccion del maiz bajo regadio [Recommendations for the Improvement of Corn Production Under Irrigation], by L. A. Serrano and C. J. Clavell (pp. 7–8).

NOTES.

Arkansas University and Station.—Recent appointments include Grace M. Henderson as head of the department of home economics, and Cecil M. Bittle, William James Wiser, and Lucille Manchester as instructors in horticulture, agronomy, and home economics, respectively.

California University—Dr. Charles B. Lipman, professor of plant physiology since 1925, died October 22 at the age of 61 years. Born in Russia, he received from Rutgers University the B. S. degree in 1904, M. S. in 1909, and D. Sc. in 1934, as well as the M. S. degree from the University of Wisconsin in 1909 and the Ph. D. degree from the University of California in 1910. Coming to California in 1908, he had served continuously thereafter, becoming instructor in soil bacteriology in 1909, assistant professor of soils in 1910, associate professor in 1912, professor of soil chemistry and bacteriology in 1913, and professor of plant nutrition in 1921. He had also been dean of the graduate division since 1923. Among his many studies may be mentioned those on nitrogen fixation by green plants, the distribution and physiology of *Azotobacter,* and plant physiology in relation to colloidal chemistry and soil fertility.

Science notes that Dr. Carl O. Sauer, professor of geography, has been given leave of absence for the academic year to make a study of native American agriculture sponsored by the Rockefeller Foundation.

Florida University and Station.—Dr. E. W. Berger, station entomologist from 1906 to 1911 and professor in entomology in the university from 1911 to 1915, died August 23 in his seventy-fifth year. A native of Ohio, he graduated from two institutions in that State, and received the Ph. D. degree from Johns Hopkins University in 1899. He was most widely known for his work as State inspector of nursery stock and as entomologist of the Florida State Plant Board from 1915 until his retirement in 1943. During this period he gave special attention to quantity production of entomogenous fungi and other aspects of biological control of citrus pests.

Purdue University and Indiana Station.—Recent resignations include J. H. Hilton, professor and assistant chief of dairy industry; Dr. F. P. Zscheile, associate agricultural chemist; Lyle Swift, assistant agricultural chemist; William Kohlmeyer and Don Mishler, assistants in poultry husbandry; and Ivor Sempill, assistant station librarian. Dr. J. H. Martin, head of the department of poultry husbandry, has been granted leave of absence for 1 year to serve as director of animal breeding experiments for the DeKalb Agricultural Association, Inc., of Illinois. Dr. J. L. Roberts has been granted leave of absence for research in connection with the United States Army. Recent appointments include F. W. Kopitzke, Selma Hicks, and Bruce Kenney as assistants in agricultural chemistry and C. C. Campbell as assistant station librarian.

Kansas College and Station.—A grant of $200,000 has been made by William Volker Charities, Inc., of Kansas City, Mo., of which H. W. Luhnow '17 is president. This is for the support over a 5-year period of an Institute of American Citizenship. The institute is to be directly responsible to the president of the college

and will have a threefold program of resident instruction, adult extension, and research. It is expected that at least four courses will be offered for both graduate and undergraduate credit. These will include the development of American life and American government, municipal and State democratic procedures, Federal government procedures, and methods that can be used by teachers to "make the study of history, civics, and citizenship participation an exciting adventure for young students." The extension program will include radio talks and forums and discussion meetings with the college faculty, Farm and Home Week audiences, 4-H Clubs, and other groups. The research program will include studies of methods used in citizen education at other colleges and universities, practical studies of city management practices, and studies in other aspects of the functioning of democracy.

W. J. Caulfield and Dr. H. E. Bechdel, associate professors of dairy industry, have resigned, the latter being succeeded by Dr. George H. Wise, associate dairyman at the South Carolina Station.

Maine University and Station.—Dr. F. B. Chandler, associate plant physiologist in the station, has accepted an appointment with the U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering, but retains the title of collaborating physiologist with the station for the fiscal year 1944–45. Iva M. Burgess, assistant geneticist, C. L. Hovey, assistant in plant pathology, and J. Wilfred Cyr, assistant agronomist, have resigned, the latter two to go into commercial work. D. B. Demeritt, head of the forestry department, has been granted leave of absence for the current year to become regional pulpwood coordinator for New England and New York with the U. S. War Production Board. Dr. Stanislas F. Snieszko, assistant plant pathologist, has been granted leave of absence to enter the chemical warfare branch of the United States Army.

Recent appointments include the following assistants: Roger M. Cobb, entomology; Dr. Marion R. Harris, plant pathology; Charles H. Moran, agronomy; and Beulah O. Wells, home economics.

Montana College and Station.—The appointments are noted of Harold R. Stucky as associate agricultural economist and associate professor, W. J. Sutter as instructor in rural engineering, and Dr. Alvin Schwendiman as associate professor of agronomy and superintendent of the Montana Grain Inspection Laboratory.

New Hampshire University and Station.—Dr. William W. Smith, assistant professor of horticulture and research assistant, returned to duty on July 1, but on August 1 was released for 6 months to the U. S. Department of Agriculture to become leader of milkweed pod collections in New Hampshire and Vermont. Raymond W. Barratt, assistant in botanical research, has resigned to accept a similar position in the Connecticut [New Haven] Station.

Rutgers University and New Jersey Stations.—Roger W. DeBaun, chief of the department of publications and editor, has been succeeded by S. H. Reck, Jr., extension service editor. Dr. Willis A. King, assistant in dairy husbandry, has been appointed in charge of the dairy research farm at Sussex.

Cornell University—Dr. E. Dwight Sanderson, professor of rural sociology organization from its inception in 1918 to his retirement in 1943, died in Ithaca on September 27 at the age of 66 years. A native of Michigan, he was graduated from the Michigan College in 1897 and Cornell in 1898 and received the Ph. D. degree from the University of Chicago in 1921. His career was unusual in that it embraced two diverse fields of specialization—entomology and rural sociology—and it also included directorships of the New Hampshire Station from 1907 to 1910 and the West Virginia Station from 1912 to 1915 and the deanship of agriculture in the West Virginia University from 1910 to 1915. His entomological work began with his service as assistant State entomologist in Maryland in 1898 and was followed by appointments as entomologist of the Delaware Station from 1899 to 1903

and associate professor of zoology from 1901 to 1902, State entomologist of Texas and professor of entomology in the Texas College from 1902 to 1904, and professor of zoology and entomology in the New Hampshire University and Station from 1904 to 1910. He was president of the American Association of Economic Entomologists in 1910 and the author of several books on entomology. As a pioneer worker in rural sociology, he organized his department in 1918 and subsequently published several books on the rural community and related topics, beginning with The Farmer and His Community, 1922, and ending with Rural Sociology and Rural Social Organization, 1942. He was editor of the Proceedings of the First National Country Life Conference in 1919 and was president of the rural section of the American Sociology Society in 1938.

Puerto Rico Federal Station.—Dr. Norman F. Childers, assistant professor of horticulture in Ohio State University and assistant horticulturist in the Ohio Station, has been appointed assistant director and head of plant research. David G. White has been appointed assistant horticulturist.

Utah College.—Dr. Dwight W. Bensend of the U. S. D. A. Forest Products Laboratory at Madison, Wis., has been appointed associate professor of forest measurements and utilization.

Virginia Truck Station.—Dr. Howard H. Zimmerley, director since 1932, died October 15 at the age of 54 years. A native of Pennsylvania, he received the B. S. degree from the Pennsylvania College in 1912, the Ph. D. degree from the University of Maryland in 1931, and the D. Sc. degree from Clemson College in 1937. Aside from brief periods in commercial work, as horticulturist in the Pennsylvania College, as county agent in Delaware, and as senior olericulturist in the U. S. Department of Agriculture, his service had been entirely with the Truck Station, beginning as assistant horticulturist in 1915–16, as horticulturist from 1918 to 1931, and subsequently as director. His work had been largely with the breeding and culture of vegetable crops. He was president of the American Society for Horticultural Science in 1935.

Washington College and Station.—Dr. Edward Franklin Gaines, professor of genetics in agronomy and cerealist, died August 17 after a long illness. Born in Missouri in 1886, he was a graduate of the Eastern Washington College of Education and had received his B. S. degree in 1911, his M. S. degree in 1913 from the State College of Washington, and the Sc. D. degree in 1921 from Harvard University. He came to Pullman in 1911 as instructor in agronomy and assistant cerealist, becoming cerealist in 1917 and professor in genetics in 1930. A recent tribute from the station points out that "he was a leader in the program to develop smut-resistant wheats adapted to Washington conditions, and wheats developed under his guidance are extensively grown in the State. His work brought him an international reputation as a wheat breeder."

Dr. W. H. Armstrong, assistant veterinarian, has resigned to accept a position with the California State Poultry Pathological Laboratory at Los Angeles.

Dr. Norman S. Lundquist, instructor in dairy husbandry in the University of Wisconsin, has been appointed associate professor of dairy husbandry and associate dairyman in the station vice Dr. A. A. Spielman resigned to accept a position at Cornell University.

School of Pan American Agriculture.—The formal opening of this school (E. S. R., 91, p. 111) was held at Zamorano, Honduras, on Columbus Day (October 12) 1944. The inaugural address of Dr. Henry A. Wallace, Vice President of the United States, characterized the event as "a milestone in the development of hemisphere solidarity." He referred to the school as "a bulwark against waste of resources, against covetousness and wars. It stands for prosperity and higher standards of living." Dedicated to aid the entire Western Hemisphere, it is "a fundamental study to advance education and peace."

Association of Official Agricultural Chemists, Inc.—The 1944 meeting of this association was held in Washington, D. C., on October 25–26, with a registration of over 400. The address of the president, G. G. Frary of South Dakota, dealt with the influence of chemistry on the development of the dairy industry. As the meeting will be the last to be held prior to the contemplated appearance in 1945 of the sixth revision of the Methods of Analysis, the program gave special consideration to changes to be incorporated in this revision. The election of officers resulted in the choice as president of Dr. William H. Ross of the U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering, and the reelection of J. O. Clarke and H. A. Lepper of the Food and Drug Administration as vice president and secretary-treasurer, respectively. President Frary, L. S. Walker of the Vermont Station, and Dr. William A. Queen of the Food and Drug Administration became members of the executive committee.

Association of American Feed Control Officials, Inc.—The thirty-fifth convention of this association was held in Washington, D. C., on October 27–28. The attendance was around 200, including representatives of 27 States, the Federal Government, and the Dominion of Canada. Because of the death on July 10 of the president of the association, William Catesby Jones of Virginia, the sessions were presided over by the vice president, R. A. Maddox of Mississippi, who took as the subject of his address The Feed Consumer, The Feed Manufacturer, and The Feed Control Official. For the ensuing year Vice President Maddox was advanced to the presidency, L. E. Bopst of College Park, Md., was reelected secretary-treasurer, and H. H. Hanson of Delaware was reelected to the executive committee. Paul Ijams of Kansas was elected vice president.

Registry for Veterinary Pathology.—Under an arrangement recently approved by the Surgeon-General of the United States Army and the board of governors of the American Veterinary Medical Association, a registry of veterinary pathology is to be set up and maintained in the Army Institute of Pathology at the Army Medical Museum, Washington, D. C. This registry will be a unit of the American Registry of Pathology, an organization operating by authority of the Surgeon-General under the sponsorship of the National Research Council.

For the Registry of Veterinary Pathology it is desired to assemble (1) material representing general pathologic anatomy, including vitamin deficiencies, specific diseases of different tissues and organs, and examples of natural and experimentally induced neoplasia; (2) a complete collection of slides representing the normal histology of different species of domesticated and wild animals, birds, and cold-blooded vertebrates; and (3) material illustrating experimentally induced lesions of infectious diseases. As material accumulates loan sets of slides and lantern slides will be made available.

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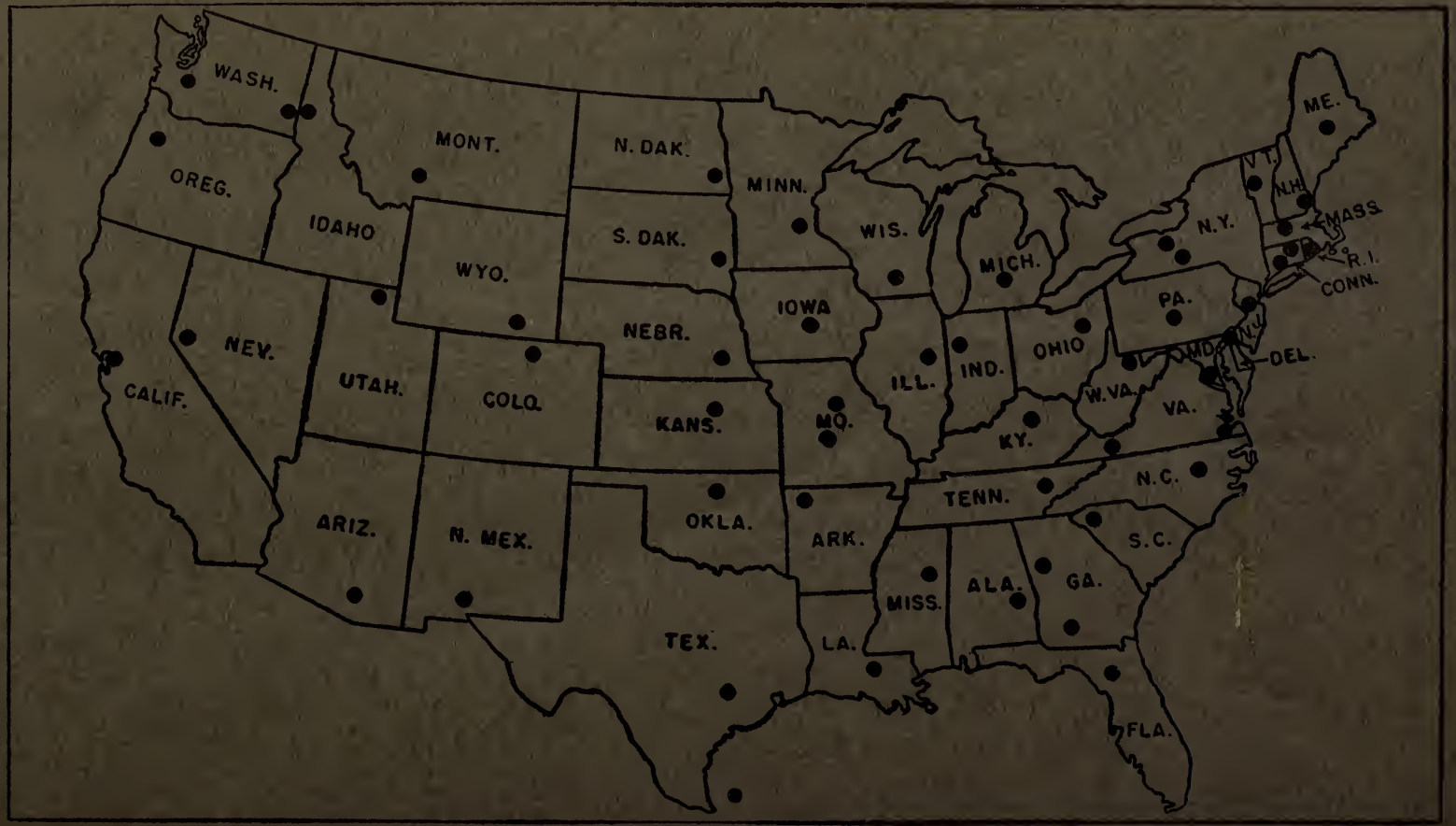
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